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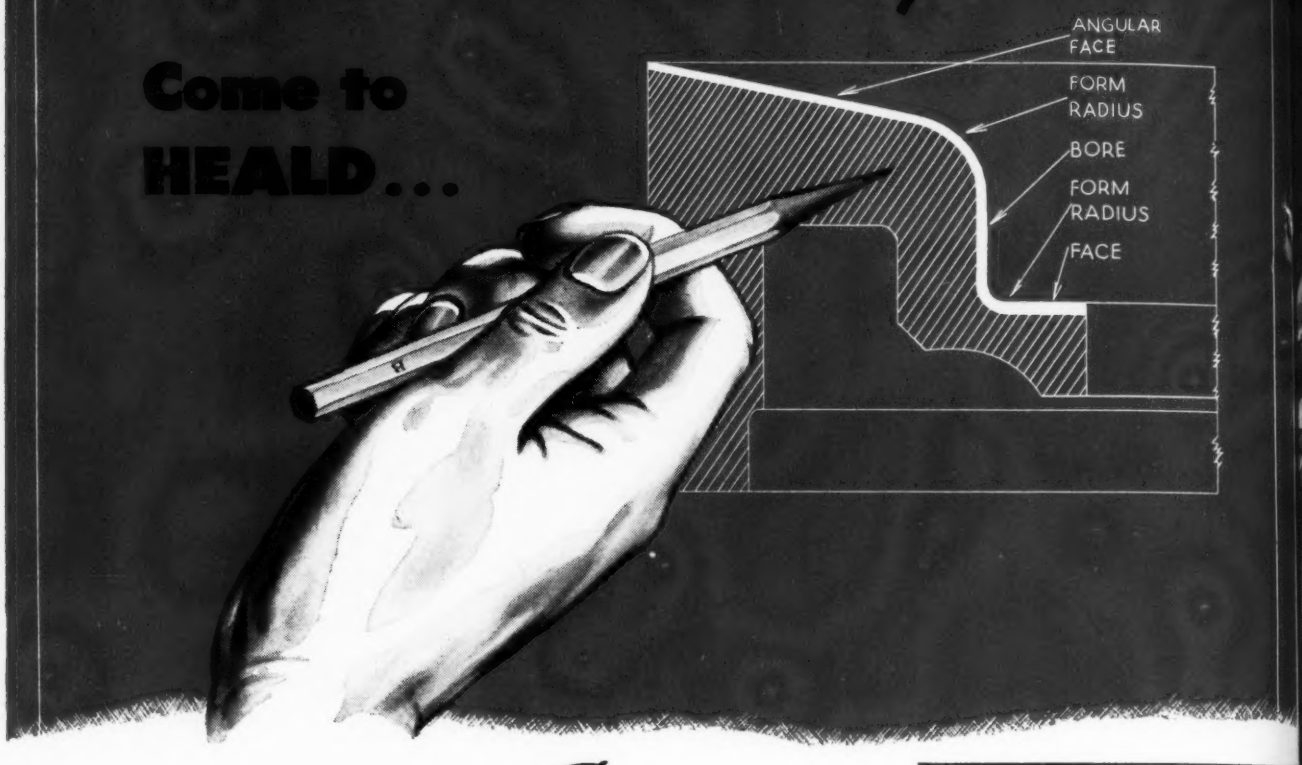

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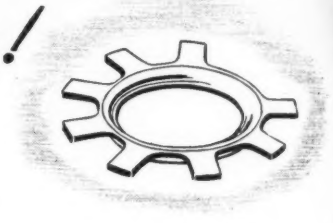

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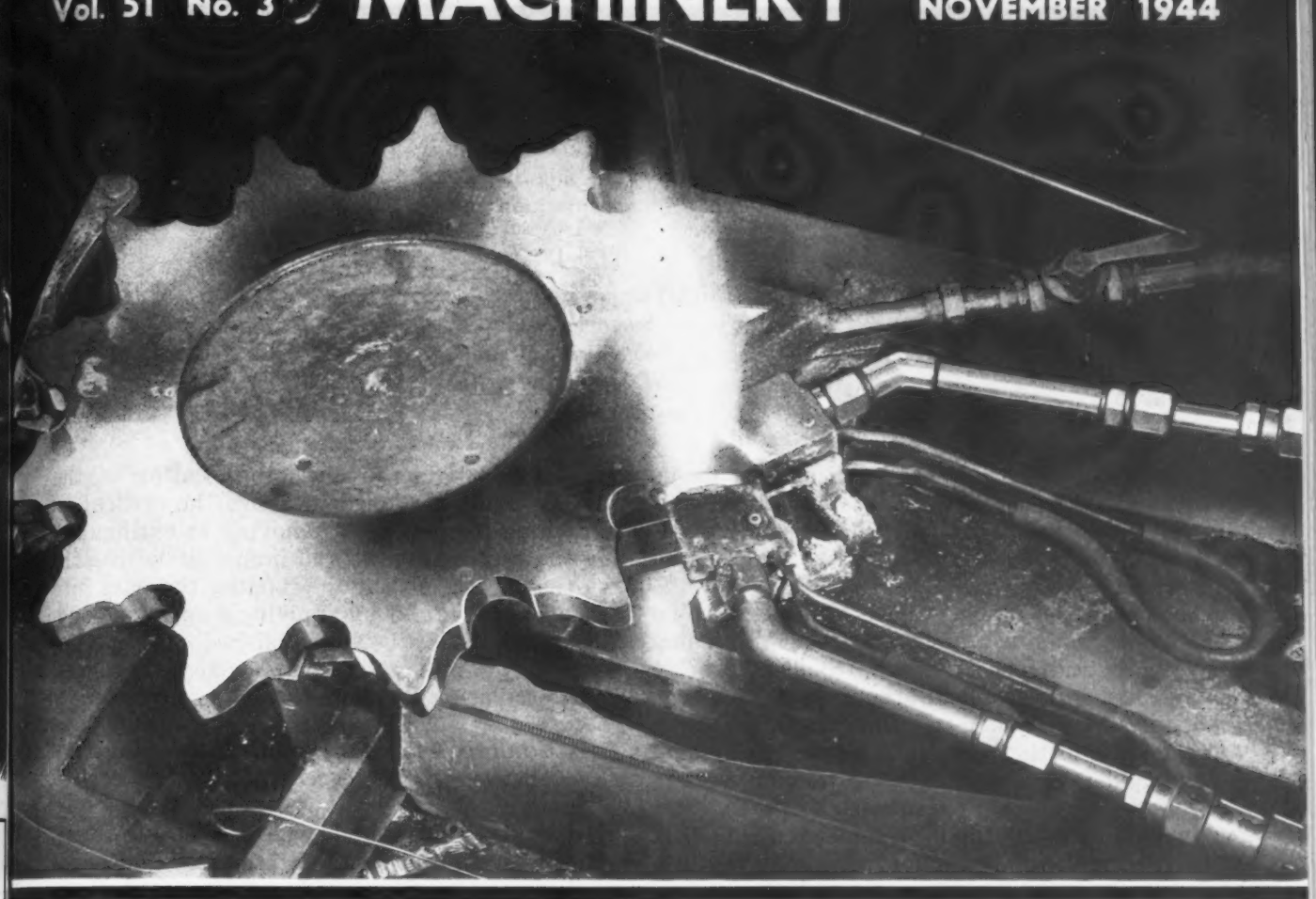


Flame-Hardening of Sprocket Teeth

Newly Developed Methods for the Flame-Hardening of Army Tank Sprocket Teeth which will Prove of Great Value in Post-War Applications of Many Kinds

By STEPHEN SMITH, Flame-Hardening Specialist
Applied Engineering Department
Air Reduction Sales Co.

ALMOST remarkable development has taken place in the flame-hardening process in connection with the hardening of the teeth of Army tank sprockets. The experience gained in this field will prove of great value in many branches of post-war industry, since the principles involved and the methods used are also applicable to many peacetime products. Army field tests have proved the advantages of flame-hardened tank drive sprockets over unhardened sprockets, with the result that all tank sprockets are now specified to be flame-hardened. These sprockets are either oxy-acetylene flame-cut from rolled plate or made

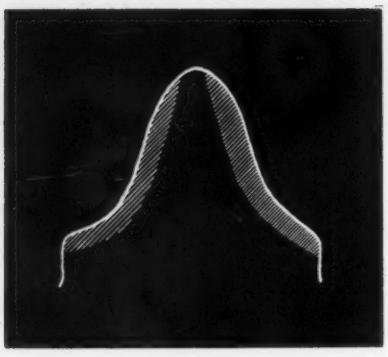
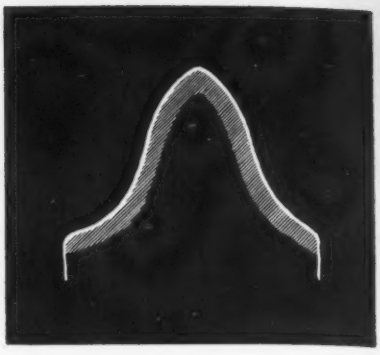


Fig. 1. (Left) Depth and Extent of Hardened Surface Produced on Sprocket Tooth Using Single-torch Manual Operation

Fig. 2. (Right) Depth and Extent of Hardened Surface Produced on Sprocket Tooth Using Manual or Mechanical Operation with Two Torches



of cast steel. The length of service of a flame-hardened sprocket is three to four times that of an unhardened sprocket. Various techniques are used in the production flame-hardening of sprockets.

Generally speaking, these flame-hardening operations make use of special flame-hardening machines and special water-cooled sprocket flame-hardening tips or burners; but since such machines require time to build, it was necessary at the start of the production of war equipment at a rapid rate to use, in many instances, manual flame-hardening operations. A set-up for manual operation can be completed in a short time, and will enable a manufacturer to perform hardening operations on a production basis without much delay. Operators properly trained in manual flame-hardening of sprockets soon become very proficient and are able to produce uniformly hardened sprockets of equal quality to those hardened with an automatic machine.

It is the object of the present article to describe in some detail the methods applied in the flame-hardening of sprockets for the information both of those who may become engaged in this work in the further manufacture of war material and for those who may find the process applicable to their post-war work.

There are two methods in use for this kind of work: (1) Spot hardening and (2) progressive hardening. Spot hardening may be (a) manual or (b) mechanical, the mechanical method being either fully automatic or semi-automatic. Progressive hardening is mechanical in character—semi-automatic.

As spot flame-hardening is the most successful method in general use, it will be dealt with in detail. The progressive method is more difficult to employ and has a number of limitations. This method, however, will also be described and its limitations pointed out.

Spot hardening involves the heating of the surface to be hardened to above the critical or hardening temperature, removing or extinguishing the heating flames, and immediately quenching the surface either by plunging the part into a quenching bath or by applying a spray quench. The heating may be accomplished by applying stationary flames over the surface to be hardened or by oscillating the flames over the surface.

Manual Method of Spot Hardening Using One Torch

In the manual method, using a single torch, one side of a sprocket tooth is heated and hardened at a time. The sprocket is mounted vertically on a horizontal spindle supported by the sides of a water tank. The tank, made of steel, is generally from 36 to 40 inches square and about 32 inches high. It is filled with water to a level approximately 1 inch below the lower side of the spindle. The water is circulated freely to maintain a uniform temperature. A 2-inch or larger pipe is used for a drain, to maintain a constant water level.

The operator, using an oxy-acetylene welding torch, plays the heat on one side of a sprocket tooth which is projecting above the water level. This side of the tooth is uniformly heated by reciprocating the torch over the surface, concentrating the heat longer at the deepest part of the tooth contour. If Airco equipment is used, a Style 9800 torch and a two-flame Style 313 tip —No. 8 or 10, depending on the size of the sprocket—are recommended.

When the heat has penetrated to the desired depth, the operator immerses the tooth in the water, thereby quenching and hardening it; then the third tooth from the one just hardened is indexed into position for heating. One side of each tooth in the sprocket is hardened in this manner.

The operator then proceeds to the other side of the tank and hardens the opposite side of each sprocket tooth. The result of the hardening is shown in Fig. 1. This method of operation leaves the extreme tip of the tooth soft; however, the wearing portion of the tooth is hardened.

The heating time is approximately ten seconds for small sprocket teeth and forty seconds for large sprocket teeth. The trained operator can become so proficient with this operation that great uniformity in depth and degree of hardness will result.

Manual Method of Spot Hardening Using Two Torches

When desired, a two-torch manual operation can be used, whereby both sides of a tooth can be flame-hardened simultaneously. The sprocket is mounted over the tank as in the method just described, and two torches and tips are used in conjunction with a cam guide, as indicated in Fig. 3.

The cam is mounted on the side of the tank. The two torches are hinged together at their rear ends by means of a fitting. Each tip has an adjustable arm attached to the rear end on which is mounted a rotating roller. These rollers are inserted into the cam grooves and the arms are adjusted for length to permit the tips to be spaced about 3/4 inch from the sprocket-tooth contour.

The tips are lighted by employing a pilot light and a gas-saver. The operator holds one torch in each hand, and moves them back and forth. The rollers move freely in the cam grooves, causing the tips to move parallel to the sprocket-tooth contour. The heat is concentrated for the greater portion of the heating time at the bottom of the tooth, and is slowly brought toward the point. In this manner, the whole tooth contour is heated uniformly.

When the heat has progressed to the desired depth, the torches are extinguished and moved away from the sprocket. The tooth is immersed in circulating water for quenching, and the third tooth from the one just hardened is indexed into position for heating. The operation is repeated until all the teeth in the sprocket are hardened. This method produces a hardened surface such as indicated in either Fig. 1 or 2, whichever is desired. It produces a satisfactory uniformity and degree of hardness. However, the two-torch method is more tiring and greater skill is required than when only one torch is used.

It should be understood that the manual operating methods are recommended only when special equipment is not immediately available and the manufacturer is anxious to start using the process at once.

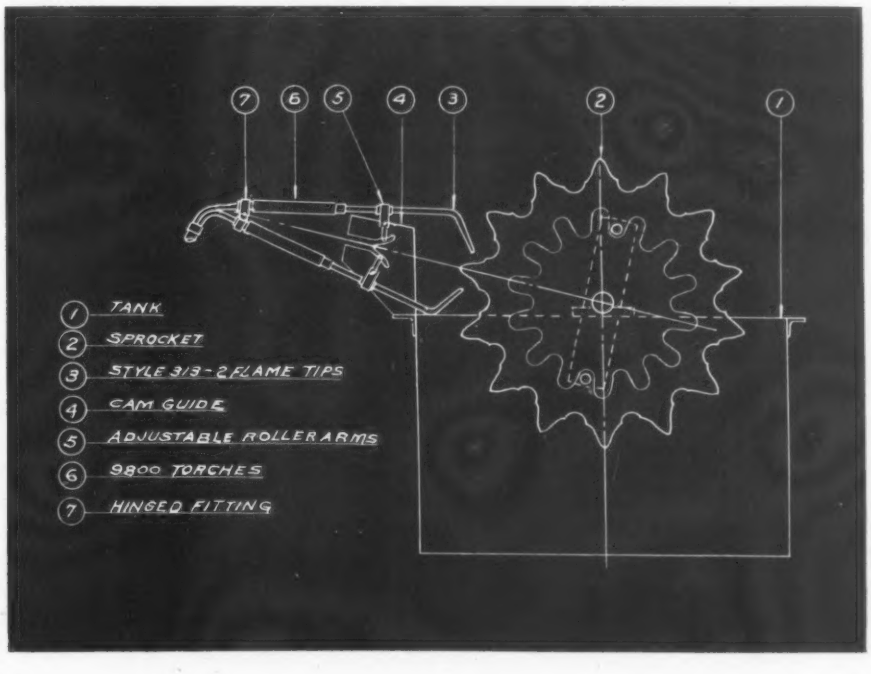


Fig. 3. Manual Method of Spot Flame-hardening Sprockets, Employing Two Torches

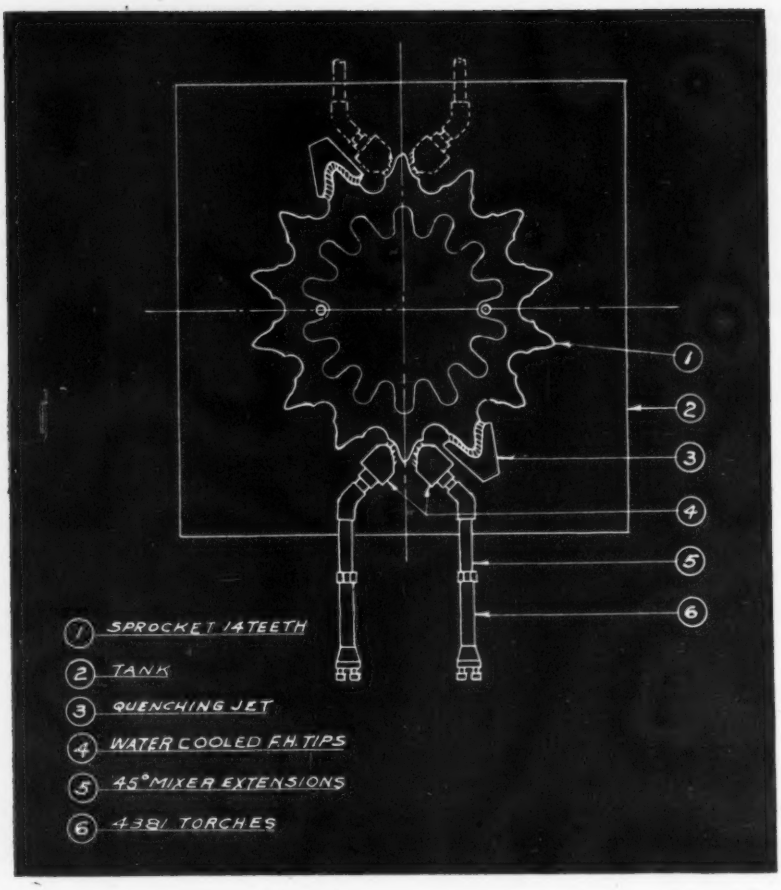


Fig. 4. Hardening One or Two Teeth at a Time by Mechanically Operated Spot Flame-hardening Method

Fully Automatic Mechanical Method with Stationary Torches

In using the automatic mechanical method of flame-hardening with stationary torches, the sprocket may be mounted on a horizontal turntable having a vertical shaft which is placed in a tank 42 inches square, as indicated in Fig. 4. If Airco equipment is used, two Style 4381 flame-hardening torches, with 45-degree extension mixers and special water-cooled sprocket hardening tips, are mounted in a stationary position on the tank and placed so as to heat uniformly the two sides of a sprocket tooth simultaneously.

The tips are designed to heat the entire contour of the tooth while held in a stationary position. The gas is fed to the tips through valve-controlled blocks, and is lighted by a city or natural gas pilot flame. The heating is timed by a suitable electric timer for a definite period (about forty seconds for large sprocket teeth) so that the heat will soak to the desired depth and bring the tooth surface to the hardening temperature. The heating time will have to be determined in the initial trial operation.

When the heating is completed, the sprockets are lowered below the tips by a hydraulic cylinder or levers electrically operated, indexed, and raised again to bring the next tooth into the heating position. The heated tooth is quenched with water supplied through a tube of adequate size, rigidly mounted close to and surrounding it, the water being directed upon the entire heated surface. This jet is timed to quench the tooth as soon as it has been indexed and may be operated by a solenoid valve.

Simultaneously with the quenching of the first tooth, the second tooth is being heated. The quenching jet is timed so that it is automatically shut off when the heating is completed and the indexing starts. The flames may be extinguished or left burning during the indexing. Since the indexing requires only a short period of time—generally a second or two—it simplifies the set-up to allow the flames to burn continuously and shut them off only when the last tooth is being hardened. By suitable timers, the cycle may be made to repeat itself automatically until the entire sprocket is flame-hardened, and then stopped to allow the completed sprocket to be removed and a new one placed in position for hardening.

The set-up described lends itself also to multi-torch arrangements whereby more than one tooth can be hardened simultaneously, as shown in Figs. 4 and 5. Multi-torch operations will, obviously, increase production two and three times with one machine and one operator.

All indexing and aligning mechanisms must be sturdy and positive, so that when each tooth is indexed and brought into position for heating, the alignment between the sprocket teeth and the heating tip will be exactly the same;

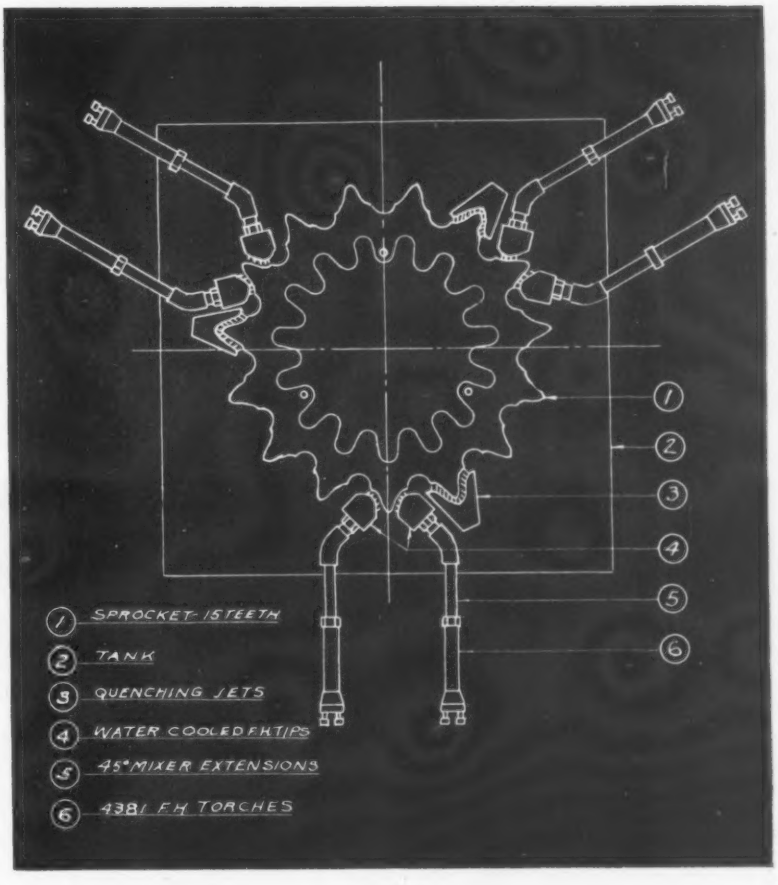


Fig. 5. Set-up for Hardening Three Teeth at a Time by Mechanical Multi-torch Operation

otherwise uniform results cannot be obtained. If the alignment is not satisfactory, one side of the tooth will be overheated and the depth of the hardened case will be greater than on the other side. Overheating will also tend to produce surface checks when the sprocket is quenched.

The set-up described can be modified by providing a vertical reciprocating motion to each torch, eliminating the necessity for lowering the sprocket while indexing, but retaining the indexing feature. The speed of the reciprocating motion may be approximately one pass across the tooth every five seconds. The length of motion should be such that the flames will not come closer than 1/4 inch to the end of the tooth.

With this type of set-up, two sprockets can be hardened simultaneously by placing one on top of the other. In this case, the length of stroke should be increased to pass over both teeth and the time for each stroke doubled. This method has the advantages over the preceding one that the handling time for loading and unloading sprockets will be slightly less, and oscillating the torches over the sprocket tooth tends to decrease the possibility of overheating the tooth surface. The heating time per tooth, however, remains the same.

In one plant, a semi-automatic sprocket flame-hardening machine is installed which is operated by electric timers and air controls. The principles involved in this machine are shown diagrammatically in Fig. 6. Sprocket (1) is mounted horizontally on a turntable (6) with a vertical shaft which is set in the center of a steel water tank. The sprocket is accurately positioned on this table by two locating pins (2). Two torches (4) are mounted rigidly on the top of the tank so that the two multi-flame tips used will heat both sides of a sprocket tooth simultaneously.

The operator lights the tips from a pilot light by pressing a button which starts the operating cycle. Both sides of the tooth are heated simultaneously for forty seconds. The heating is controlled by an electric timer. When the heating cycle is over, air controls shut off the flames and release a hand-lever (9) connected to the turntable, which allows the table and sprocket to tilt on shaft (7) and immerse the tooth in the water for quenching. The operator tilts the sprocket further manually, assisted by a counterweight (11) until the tooth is completely immersed. Additional quenching is provided by a running stream of water directed on the tooth from a 3/4-inch pipe (15) entering the tank from the side. The quenching cycle is also forty seconds.

After a period of forty seconds, the operator tilts the turntable further, which causes pins (10) on the turntable to strike a projecting bar (14) in the tank and results in indexing the sprocket to the next tooth. The operator then returns the sprocket to the horizontal position

by means of the hand-lever. This places the next tooth in position for heating.

The teeth to be hardened are aligned with the heating torches by means of a spring-loaded bar (3) which presses against the side of one of the sprocket teeth. This pressure forces another tooth against an adjustable stop (8). The hand-lever (9) is locked in place by a compressed air cylinder (13) which operates a latch (12). When the lever is locked, the operator starts the flame-hardening cycle over again by pressing a button.

The operating cycle is controlled by an electric timer which operates air controls that open and close oxygen and acetylene control valves. The acetylene is fed from the line through a filter into a water seal and thence to the torch. The heating tips are multi-flame tips shaped to the contour of the sprocket. Nine flames are used on each side of the tooth, arranged so as to concentrate the heat at the groove of the sprocket tooth.

An automatic machine has been built by the Hydraulic Machinery Co., Inc., Detroit, Mich., especially for flame-hardening sprockets. This machine, shown in Fig. 7, is used by one of the largest manufacturers in the country. It consists essentially of a circular indexing table and a reciprocating table. The indexing table carries the work, and the reciprocating table a heating torch of multiple-jet design and a quenching head. A gas pilot is assembled with the torch. All movements, including correct timing, are automatic, following the initial set-up. The cycle is started by merely pressing a button.

The initial machine movement, with the sprocket in place on the indexing table, brings the torches and quenching head into position to surround adjacent teeth. At the same time, the pilot flame ignites the tips, to which gas has been turned on by the automatic operation of electric holding relays and solenoid valves in the supply lines to the torch head. Also, water is turned on to the quenching head automatically.

The forward movement of the table carrying the torch engages a limit switch, thus starting an electric timer which de-

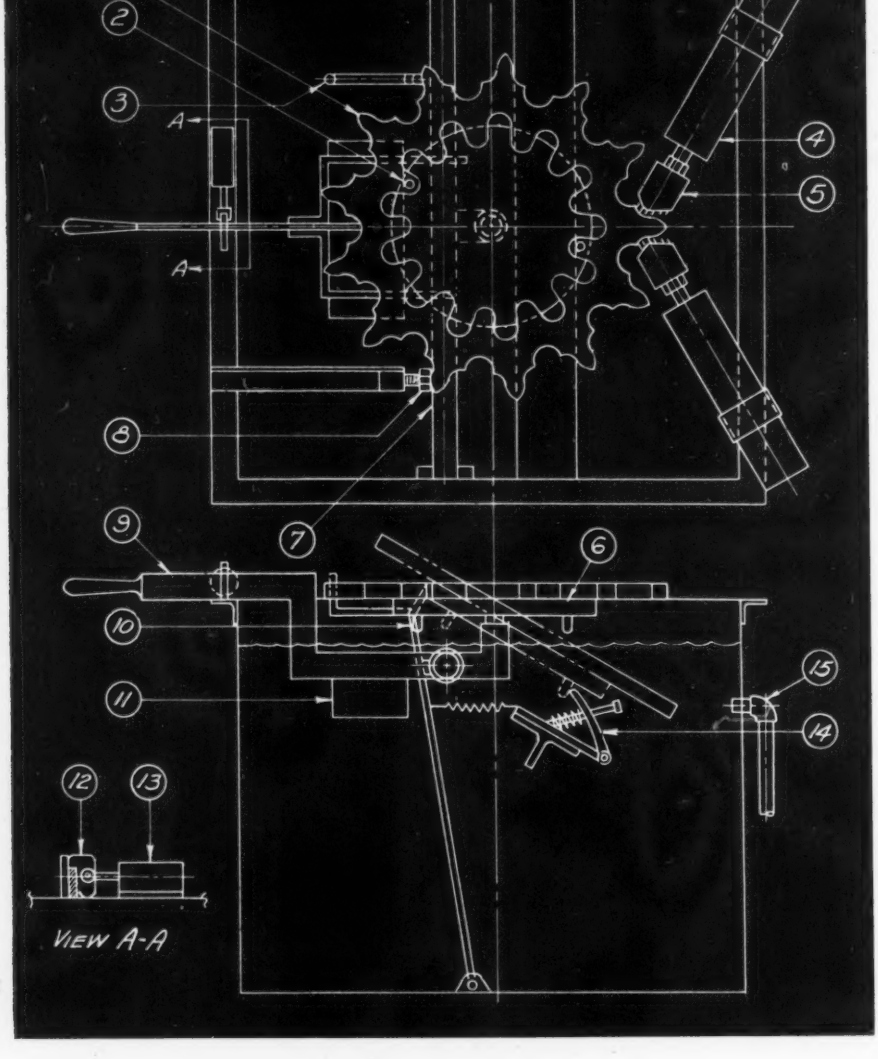


Fig. 6. A Semi-automatic Operation Applied to Spot Flame Sprocket Hardening

termines the dwell required for the tips to bring the tooth they surround to the proper temperature. At the end of this period, the table reverses so that the torch and quenching head clear the teeth, the work indexes one tooth, the table returns to bring the tips into position around the next tooth, the quench is applied on the heated tooth, and the timer starts again.

These movements are repeated until the last of the thirteen teeth in the particular sprocket for which this machine was built has been heated. As the table draws away at this point, the gas and oxygen are shut off from the tips automatically, so that only the quenching head is operating when the torches and tips are returned to the operating position, permitting the hardening of the last tooth. Then the table moves out, and the machine comes to a stop for unloading and loading.

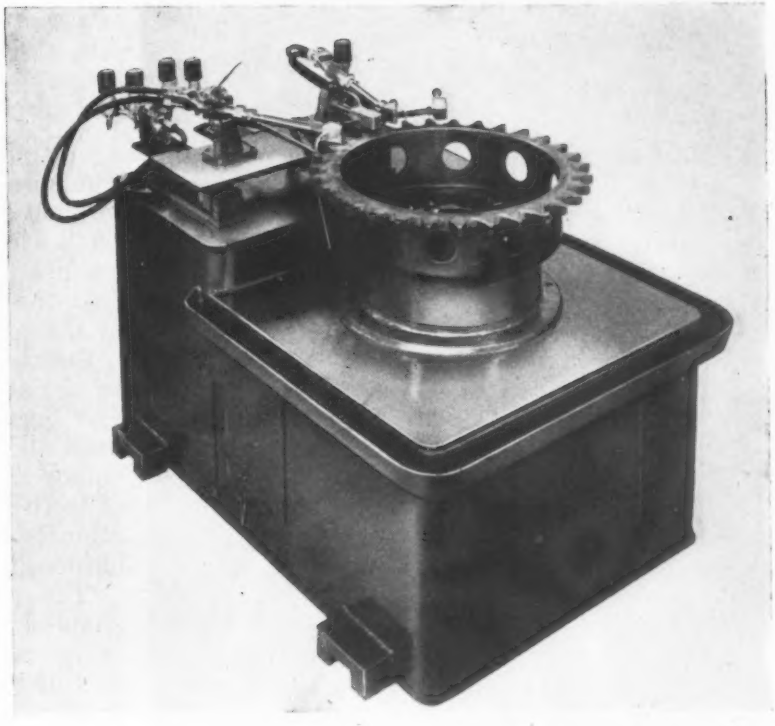


Fig. 7. Automatic Sprocket Flame-hardening Machine

The machine is hydraulically operated and electrically controlled. The working parts are shielded against overheating and entrance of quenching water. The over-all dimensions are 38 inches wide by 60 inches long.

At the Eaton Mfg. Co.'s plant in Detroit, sprockets are flame-cut from rolled plate. Annealing follows flame-cutting, after which the sprockets are completely machined to finished dimensions, including the tooth contour. Flame-hardening is the final operation.

Fig. 9 shows the flame-hardening set-up at this plant. Sprockets are flame-hardened by the spot-hardening method in a semi-automatic machine. The sprocket is mounted horizontally on a turntable. Two heat-treating torches with special multi-flame burners are mounted on a movable carriage and are positioned to heat both sides of a sprocket tooth. The heating cycle is forty seconds. The sprocket is indexed by a manually operated lever, which moves the torches away from the sprocket and brings the next tooth into position for heating. As the next tooth is being heated, the preceding heated tooth is quenched by a water spray mounted on the torch carriage. Thus, the quenching operation is simultaneous with the heating operation.

An electric timer, activated by a push-button, lights an electric bulb and rings a bell when the heating cycle is completed. This signals the operator to index to the next tooth. After the last tooth has been heated, the burners are extinguished manually by closing an oxy-acetylene gas control valve, and the tooth is indexed to the final quenching position, which completes the hardening of the sprocket. The sprocket is then removed manually from the machine and another is placed on the turntable for hardening.

Uniform heating and quenching are assured by positive positioning of each tooth with relation to the burners. With the arrangement shown, a complete sprocket is hardened in ten minutes, or, in steady production, four and one-half per hour. Greater production can be obtained with multiple-burner units heating two or more teeth simultaneously.

Progressive Hardening Method

In the progressive hardening method, a number of sprockets are nested together. Ten or more, as desired, depending on the handling equipment available, may be mounted on a hori-

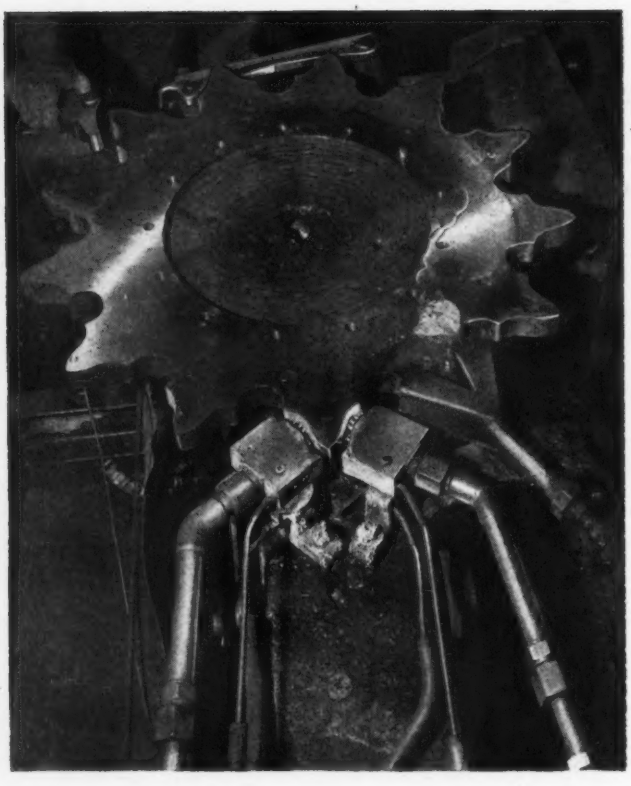


Fig. 8. View Showing the Application of Torches and Quenching Head on Machine Illustrated in Fig. 9

zontal shaft suspended over a tank of water. The sprockets are lined up to present one tooth of each sprocket on the vertical center line, all teeth being in alignment. Two flame-hardening torches are mounted on a traversing machine, with the torch tips positioned to heat both sides of the sprocket tooth simultaneously.

Starting at the end sprocket, the tips are moved at uniform speed over the teeth, heating and quenching them in a progressive manner until all in one row are hardened. The nest of sprockets is then indexed to bring the next row of teeth into position for hardening. This operation is repeated until all the teeth have been hardened.

The progressive hardening method is the simplest one from a mechanical point of view, as no complicated mechanism is required for moving the sprockets or tips. However, it is not practicable for hardening sprockets for tanks, because of the type of steel these sprockets are

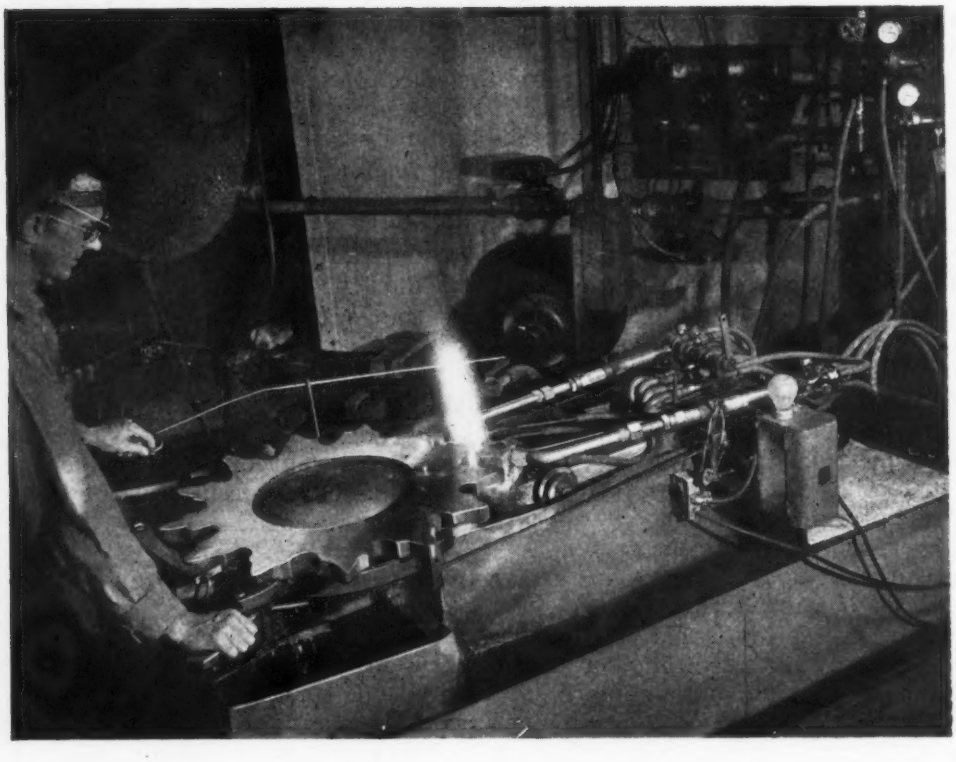


Fig. 9. Semi-automatic Machine Used for Spot Flame-hardening Tank Sprockets

made from and because of the great depth of hardness required—1/4 inch. To produce this depth, a soaking heat is needed, which necessitates a slow movement of the tips over the surface—approximately 2 inches per minute. With such a slow movement in the progressive hardening method, the surface of the teeth would become overheated, and the quench following immediately would produce surface checking.

Second, there is an air space between each sprocket, which prevents the direct conduction of heat from one tooth to the next. This results in non-uniform distribution of heat as the operation progresses, and consequently, a non-uniform depth of hardening across each tooth.

A third disadvantage is that all the teeth must be in very close alignment to obtain uniform heating. This is difficult to obtain because of the differences in dimensions of the teeth, due to machining variations with large tolerances.

As a general precaution, sprockets should always be normalized or annealed before flame-hardening to prevent any possibility of surface checks developing during the operation, which may be caused by strains in the steel. After flame-hardening, the sprockets should be stress-relieved in a furnace or oil bath.

* * *

Reserves Required to Prevent Unemployment

A most important subject was dealt with by Roe S. Clark, president of the National Metal Trades Association, before the recent Plant Management Conference sponsored by the Association. Mr. Clark, who is also vice-president of the Package Machinery Co., Springfield, Mass., said that unless industry is permitted to accumulate adequate reserves, there will be likely to be much unemployment during the reconversion period. The renegotiation of Government contracts and high corporation taxes are the chief reasons why industry has been unable to accumulate any appreciable reserves for post-war requirements. He also emphasized the necessity of educating employes to an understanding of industry's problems. If the workers in an industry could thoroughly understand that their welfare depends upon the ability of their employer to make ends meet, workers and management could form a great team—both understanding each other's problems.

Business Papers Help Rehabilitate Hospitalized War Veterans

The Industrial Marketers of Cleveland, a chapter of the National Industrial Advertisers Association, has launched an educational campaign that is designed to assist in the re-education of wounded war veterans. Recognizing the fact that many of the wounded veterans, who before the war were engaged in some profession or trade, require to be brought up to date on the progress and developments in the industry or occupation in which they were engaged, the Cleveland group is active in supplying technical and other business magazines to the hospitals where war veterans are cared for. Copies of industrial and trade journals that have served their purpose in the offices of various advertising agencies are being collected and are forwarded to the hospitals, where they can be of use to convalescent veterans.

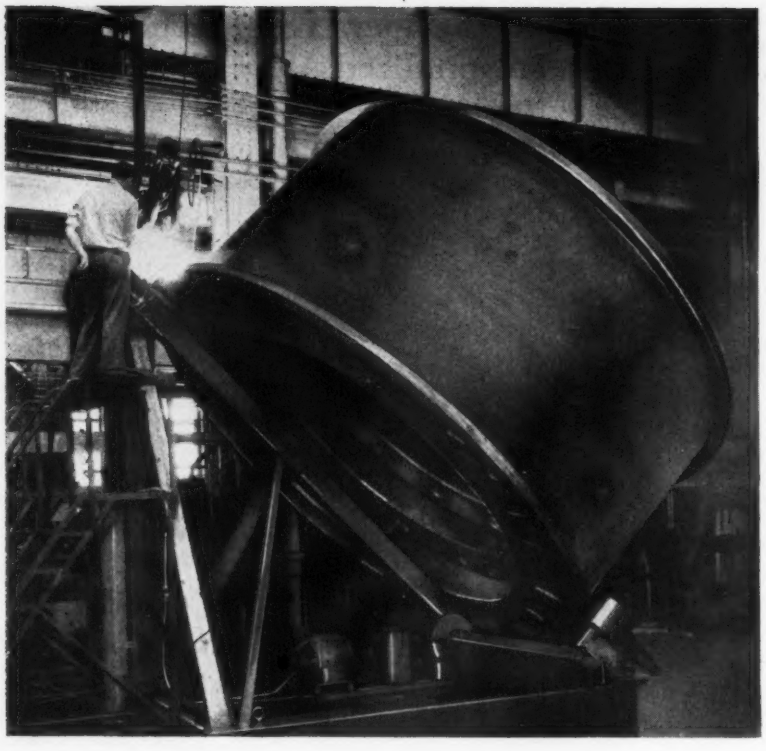
Details pertaining to the plan are outlined in a bulletin entitled "Technical Training Rehabilitation," published by the Industrial Marketers of Cleveland, 422 Leader Bldg., Cleveland, Ohio. The idea is one that might well be taken up in other communities, not only by advertising agencies, but by industrial groups in general. Simple rules of procedure are given in the bulletin. New ideas that may be applied by national and local business associations will occur to those interested in this plan to make use of the wealth of information in the business papers.

* * *

Machine Tool Shipments and Orders Still at High Level

According to the Tools Division of the War Production Board, the shipments of machine tools in August, the last month for which complete figures are available, were valued at slightly over $35,000,000, or at an annual rate of $420,000,000. The value of net new orders received in August—that is, total orders less cancellations—was slightly over $40,000,000, or at an annual rate of $480,000,000. The backlog of unfilled orders was approximately $196,000,000 at the end of the month. At the rate of shipments in August, it will take the industry over five and one-half months to catch up with this backlog.

Progress in Automatic Arc Welding



Improved Automatic Arc-Welding Machines and Equipment are Capable of Reducing Costs, Increasing Production, and Improving Quality of Product—First of Two Installments

By R. F. WYER
Application Engineer
Electric Welding Division
General Electric Co.
Schenectady, N. Y.

PRACTICALLY all the reasons for using machine arc welding are tied up with economy. Besides the obvious economy resulting from increased welding speeds, there are other factors not quite so obvious. In general, increased speed of arc travel is not the factor of primary importance in making machine welding pay. In metal arc welding, an increase in arc travel speed of 10 per cent over hand welding speeds can be considered a fair figure, because the increase results not from any change in the process itself, but merely from the elimination of some variables which would necessitate reduction of the maximum available speed.

In the case of arc welding with coiled electrode, some increase in speed can be expected, because the electrode is not subject to heating to any appreciable extent. Since the welding current is introduced into the electrode close to the arc, only a short length of the core wire is heated for a brief period of time; consequently where the work will stand it, the current can be increased somewhat without overheating the wire.

There are, of course, exceptions to the general rule. On unusually thin stock, where it is somewhat difficult to develop the technique required for manual welding, and particularly where the inherently high welding speed is a handicap to manual operation, very large increases in speed can sometimes be obtained by machine welding. Similarly, where extremely accurate jigging is made a part of the machine welding program, considerable increases in actual arc travel speed can sometimes be obtained. Obviously, where only relatively unskilled welding operators are available, machine welding will to a large extent increase speed by eliminating the need for skill and experience.

The main factors in the economy of machine welding are the increased duty factor and the uniform quality which can be achieved by substituting mechanical parts, and volts and amperes, for the hands and energy of the welding operator. In most cases, this does not mean displacing the welding operator. It means, simply, relieving him of the necessity of performing the mechanical functions of maintaining the proper arc length and travel speed.

The expected increase in duty factor usually comes about from the practical elimination of operator fatigue, and the pacing effect of machine operation. It is only natural that when the machine is doing the tedious work, there is less tendency for down time than there is when the

breaking of the arc signals relief from mental concentration and restraint of physical activity.

In the case of a refrigerator compressor case job, where an edge weld was made on a roughly spherical housing by manual welding, mechanical rotation of the work was provided, and the welding heat was stepped up to the point where the electrodes actually became overheated and had to be laid aside to cool when half consumed. Everything was made convenient for the operator in an effort to increase production speed. An actual arc travel speed of a little faster than 30 inches per minute was achieved, and this was rightly assumed to be comparable to what could be expected with machine welding. A duty factor of 60 per cent was expected on the basis of careful job analysis and liberal allowances for personal time out. Yet the day-by-day average duty factor, figured from the undeniable evidence of daily production, was approximately 30 per cent. In addition, while leakers requiring patching were relatively few during the morning hours, the average number from week to week was close to 10 per cent of the total production.

Uniformity in the quality of welding is practically a foregone conclusion with machine welding. Provided that adequate equipment and uniform quality electrodes are employed, it is the one factor of joint preparation that primarily determines the uniformity of quality.

Flux-shielded arc welding is not described in this article, because the transition from normal shielded-arc or bare electrode welding to the flux-shielded process is accompanied, almost without exception, by a large increase in actual arc travel speed, which needs no explanation. In cases where flux-shielded arc welding is not profitably applicable, however, machine welding by the shielded arc or bare wire, atomic-hydrogen arc, or inert gas-shielded arc processes will frequently pay its way in comparison with manual welding with the same process.

Fig. 1. Automatic Arc-welding Head for Use with Bare and Lightly Coated Electrodes

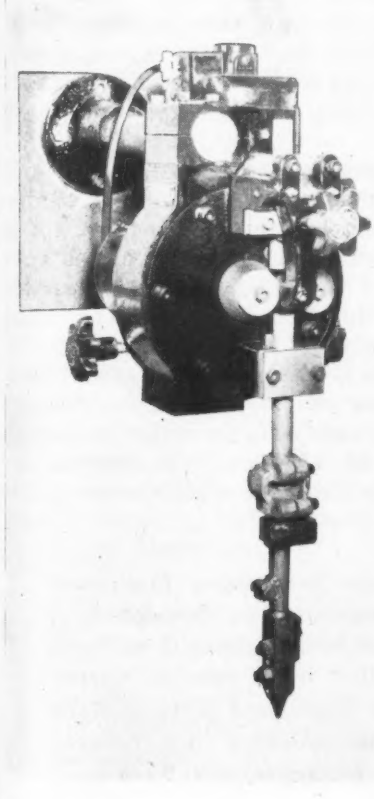


Fig. 2. Automatic Arc-welding Head Designed for Use with Coil Type Electrodes

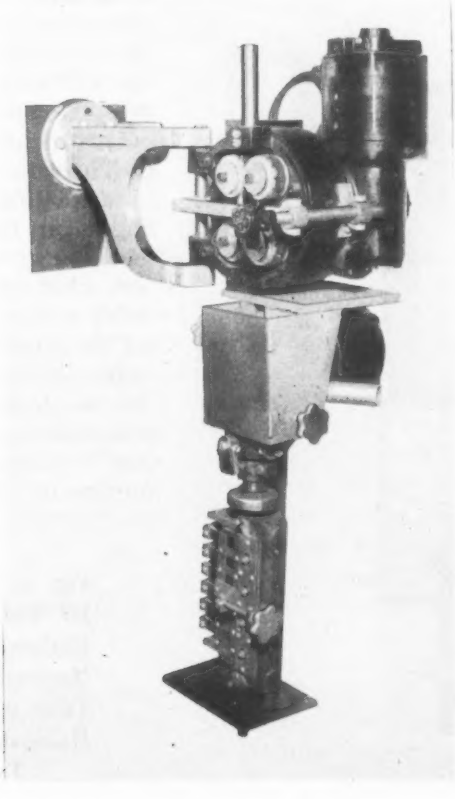
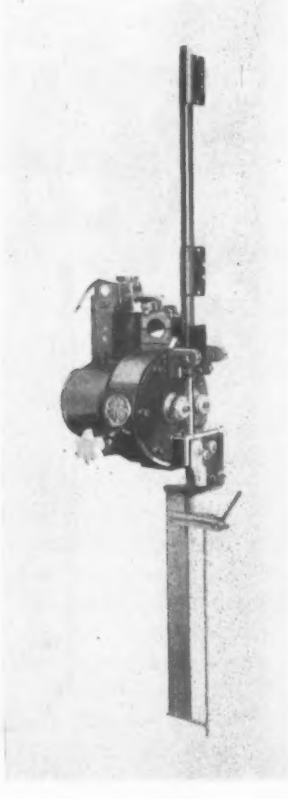


Fig. 3. Welding Head Equipped for Feeding Short Electrode Lengths



Types of Arc Welding Handled on Automatic Machines

There are types of automatic welding heads providing automatic maintenance of the proper welding arc length for all the arc-welding processes, which may be classified as follows:

1. Metal arc welding with bare and lightly coated electrodes (Fig. 1).
2. Shielded arc welding with coiled electrodes (Fig. 2).
3. Shielded arc welding with short lengths of electrodes. The stick-electrode feeder attached to an automatic arc-welding head for using short lengths of electrode is shown in Fig. 3.
4. Carbon arc welding.
5. Inert-gas shielded arc welding, with or without the addition of filler (Fig. 4).
6. Atomic-hydrogen arc welding (Fig. 5).

In all the equipment illustrated, as in any type of automatic arc-welding head in practical use today, the arc voltage is used to determine the proper position of the welding electrode or its rate of feed. In the units here described, electronic tube control panels are employed to regulate the speed and direction of rotation of the electrode driving motor. They not only rectify alternating current from a single-phase 230-volt supply line so as to make it suitable for driving the direct-current motor, but they reverse the motor, when required, to strike the arc or regulate its length, and adjust the magnitude of the motor current to within very close limits in response to the signal impressed on the tube circuits by the welding arc voltage.

Design and Operation of Different Types of Machines

The welding head shown in Fig. 1 is basically a motor-driven wire-feeder, with means for introducing welding current into the bare or lightly coated electrode. It consists of a direct-current motor which drives, through a worm-gear speed reduction unit, a pair of knurled feed-rolls which grip the electrode and propel it up or down through wire guides. At the lower end of the assembly is located the nozzle or current collector, which delivers welding current to the electrode through pressure fingers bearing on the wire. A conveniently located operator's station provides push-buttons and selector switches for controlling the starting and the stopping of the welding arc and the traverse mechanism, as well as a voltmeter and ammeter for indicating the proper welding current and arc length adjustment.

The automatic welding head shown in Fig. 2 is a modification of the unit just described, designed to feed heavily coated electrode of a special design which can be coiled. Four feed rolls are used instead of two, and they are equipped with rubber tires, in order to prevent crushing of the electrode coating. Immediately below the wire-feeder itself is located a slitting saw, driven by an electric motor, which cuts a slot through the coating of the electrode in order to permit the introduction of the welding current by means of six contact fingers which bear on the

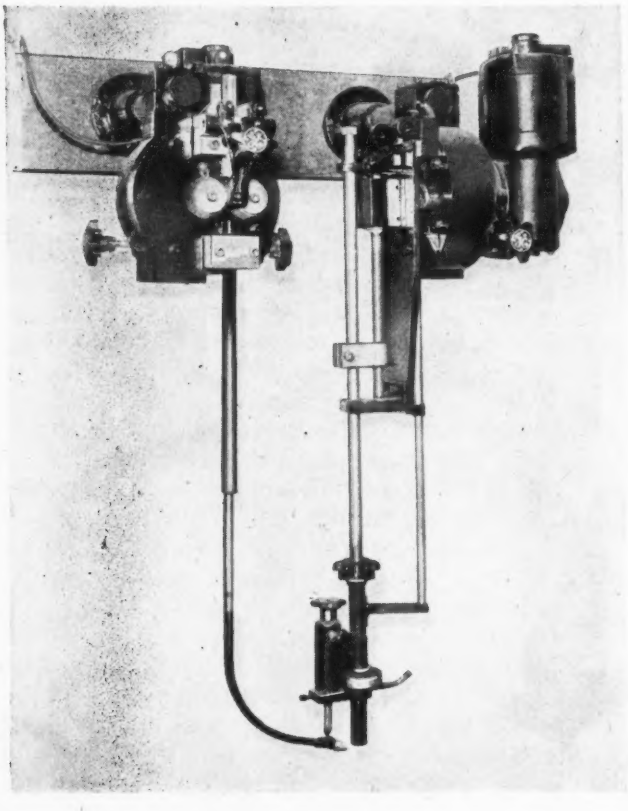


Fig. 4. Automatic Arc-welding Equipment for Welding Magnesium in Atmosphere of Helium. The Left-hand Welding Head Feeds Magnesium Filler Wire through Curved Tube while the Right-hand Welding Head Maintains Helium-shielded Arc between Tungsten Electrode and Work

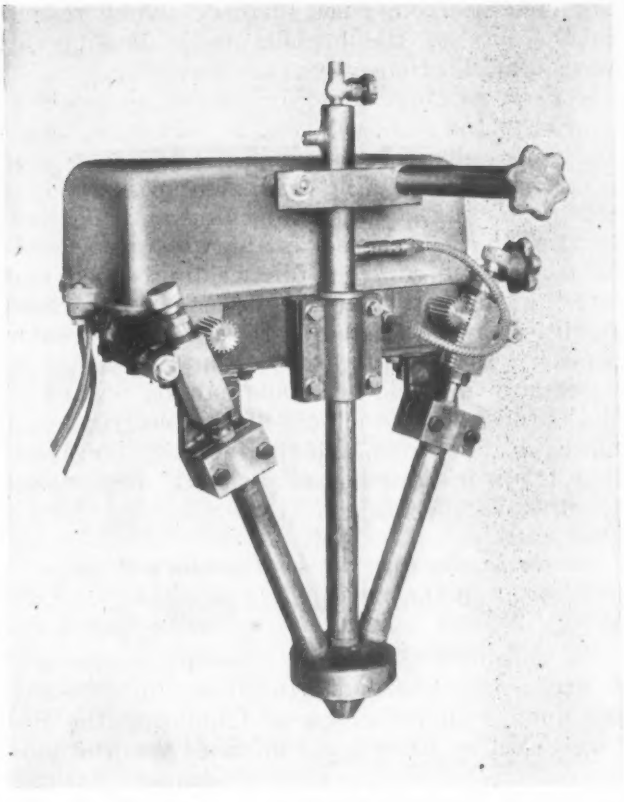


Fig. 5. Automatic Atomic-hydrogen Arc-welding Head with Arrangement for Regulating Welding Arc Lengths

core wire through the slot. The contact finger assembly is located at the bottom of the welding head, just above the electrode guide nozzle and heat shield.

Another modification of the same basic design substitutes an electrode clamp driven up and down by a rack and pinion, for feeding standard cut lengths of electrodes up to 18 inches long. A guide finger at the bottom of the assembly steadies the electrode, and limit switches located at the top provide automatic reversal of the welding head, so that it returns to its loading position as soon as a stick of electrode is consumed.

Still another modification of the same basic welding head, shown in Fig. 4, provides very fine adjustment of the height of a tungsten or carbon electrode, in inert-gas shielded welding. At the lower part of this assembly is located a gas nozzle which surrounds the electrode. The gas nozzle and electrode collet are moved up and down to regulate the arc length by means of a feed-screw driven by the motor and worm-gear speed reducer. Adjustment of the position of the electrode nozzle with respect to the electrode is provided, in order to permit compensating for very slow burn-off of the electrode.

The automatic atomic-hydgrogen arc-welding head shown in Fig. 5 is a quite different version of the same basic equipment for regulating welding arc lengths. Here two tungsten electrodes, inclined at an angle toward each other, are driven up and down, in order to regulate the distance between their tips, thus regulating the length and heat output of the atomic-hydrogen arc which burns between them. The important difference in this equipment is that it drives two electrodes instead of one, and at very slow speeds (except when striking the arc) to compensate for the gradual consumption of the tungsten electrodes.

Prerequisites for Efficient Automatic Arc Welding

In order to get the maximum benefit from machine welding with the automatic welding heads described, three factors are essential:

First, there must be a sufficient quantity or volume of production involved to pay for the fixed charges on the automatic welding heads and the mechanical fixtures and handling devices that must be used with them. Whether this quantity is several hundred or several thousand depends, of course, on the nature of the product and the amount of welding involved in each unit.

Second, uniformity in the product is essential to economical machine welding. While a welding head and fixture may be designed to take care of several sizes of the same product, or even widely different products, it is practically necessary that the contour of each piece be similar in order to make machine welding pay. The importance of uniformity cannot be overemphasized in connection with fit-up. The general rule is that the better the fit-up, the better and faster the welds can be made. But regardless of whether the fit-up is only good, or whether it is excellent, the important thing is that it be the same from piece to piece. If this condition is not met, then it becomes necessary to change the adjustment of travel speed, or angle of the electrode, or welding current, or

arc voltage, from piece to piece, which results in the loss of the benefits made possible by proper application of machine welding.

Third, machine welding should be mechanized in so far as possible. It is, of course, practical to mechanize a manual welding job—that is, to provide handling equipment which shortens the loading and unloading time and adequate fixtures that will speed up the welding, as well as convenient controls for welding speed and welding current. But the investment in these facilities can be wasted by the welding operator himself. In the same sense, the investment in automatic arc-welding heads can be wasted if the fixtures, the functions of the electrical and mechanical controls, and the facilities for handling the work are not all properly engineered together as one project.

Basic Factors to be Considered in Welding Fixture Design

In considering machine welding equipment, it may seem superfluous to stress the necessity for quality in designing and building the fixtures. Yet so many good machine welding jobs have been handicapped by inadequate fixtures that it is clearly necessary to impress on the designer certain basic considerations.

First of these is accuracy of alignment. The designer of the machine welding fixture should think in terms of thousandths of an inch rather than fractions. The machine welding fixture is a machine tool, and must be designed as such to be successful. The tolerances on run-out of rotating parts, for example, will depend somewhat on the thickness of the work to be welded and the design of the joint. Regardless of whether a butt joint is in 1/16-inch or 1/4-inch material, however, an offset of one plate above another of more than 10 per cent of the plate thickness is likely to give serious trouble. In the case of 0.050-inch material, the fixture must certainly be aligned to within 0.005 inch, and preferably to closer tolerances.

Consideration of alignment should go beyond the original lay-out and construction, to foresee effects of wear and distortion. This indicates the necessity of liberal allowances for mechanical and thermal stresses and the provision of really rigid structures throughout.

Next to accuracy of alignment, accuracy of speed control is probably most important in getting a good machine welding fixture. The range of adjustment of the speed of traverse or rotation should be great enough to accommodate any welding job contemplated on the fixture in question. At every point in that range, it should be possible to maintain speed with a tolerance never exceeding plus or minus 5 per cent, and on critical jobs with a much smaller tolerance. In the high-speed welding of thin material, for example, speed variations of 2 or 3 per cent may make themselves evident in non-uniform welding, particularly in regard to the size of the bead and the presence of porosity and inclusions. Since electronic control is now available which will hold the speed of a direct-current motor (supplied from an alternating-current source) to a 1 per cent tolerance if necessary, even in the presence of considerable line voltage variation, there seems little excuse for sacrificing welding performance for lack of accurately maintained speed.

It should be stressed that not only the average speed, but the speed of travel from second to second must be accurately maintained if good welding is to result. For example, a fixture on which poor welding was being obtained was checked by means of a stop watch, measuring the number of seconds required to make one revolution. On repeated tests, it was found that the speed of rotation was always the same, within the limits of error, in reading the stop watch. However, when a paper tape unwound from the machine shaft was mechanically marked at precisely one-second intervals, it was found that there were variations of 10 and even 15 per cent in the space between marks. Upon this conclusive evidence of momentary speed deviations from a constant average, the drive was replaced, with immediate improvement in the welding.

On any welding operation that has proved critical, by reason of high speed, thin stock, or highly fluid molten metal, every effort should be made to hold speed variation to the minimum, with a tolerance of plus or minus 1 per cent as the goal.

While many joints, particularly edge and lap joints in circular sections, can be made self-supporting and tight-fitting without external support, there are others that must be clamped rigidly to prevent warping and buckling. Except in heavy plates or work that can be adequately tack-welded, for example, longitudinal seams usually require accurate clamping in order that satisfactory results may be obtained.

Important Factors to be Considered in Designing Work-Holding Clamps

While clamping, chilling, and backing are all interrelated, chilling and backing have other functions besides clamping. Probably all clamps exert some chilling action, but this can frequently be increased or decreased by the choice of material used for the clamps, its thickness, and auxiliary cooling, as by water passages or jets.

In clamping, the basic objective is to form the plate edges as required to bring them into metal-to-metal contact, with accurate alignment, and to hold them in contact and alignment during the welding operation. Here there frequently arises a controversy between the welding department and the contributing department in the factory. The contributing department sometimes expects the jigs and fixtures of the welding department to do some of the forming, which actually should be done before the work is brought to the welding department.

The best way to settle questions of this kind is to remember the old saying that the welded product is no better than the parts that are brought to the welding department. If a welding jig or fixture, properly designed by experienced men, will not hold the parts to be welded in accurate alignment, then the preparation of the parts in the contributing department should be improved.

To get the most out of a machine welding installation, standards should be set up for the fit, alignment, and joint preparation of the parts. These standards should have nothing whatever to do with welding, but should be based on actual mechanical measurements. No decision as to the presence or absence of improper fit and preparation of parts should be based on the results of actual welding in the shop, once the development of proper joint design and preparation has been achieved. To depend on welding results almost invariably introduces the question of whether the welding itself or the parts that are joined are to blame for trouble. Experience in many cases has shown that the best way to increase production quantity and quality in cases of this kind is to insist that all parts coming to the welding department should meet certain standards, and that the welders should refuse to attempt to weld parts that do not meet those mechanical standards.

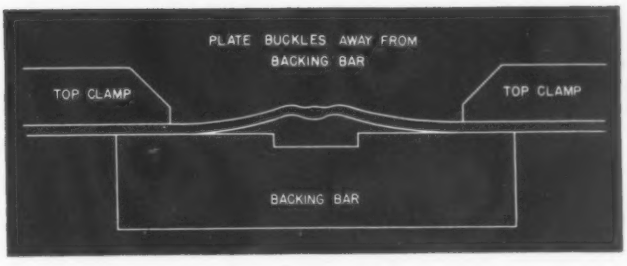


Fig. 6. Diagram Showing One Effect of Thermal Expansion of Stock between Clamps that are Too Far Apart (Exaggerated)

In the design of clamping parts, the best general rule is to keep the clamps as close to the joint to be welded as practical without interfering with the welding operation or subjecting the clamps themselves to burning from the arc. To space the clamps too far apart introduces two major hazards. One is that the metal will warp and twist out of alignment as the heat of the arc hits it, with the result that fit-up is poor even though, when cold, the parts fit perfectly.

The other danger applies particularly to the welding of butt joints, where too great separation of the clamps results in too much expansion of the metal—with consequent upsetting of the molten or plastic material during welding in the case of heavy, stiff stock or with actual buckling of the material transverse to the joint in the case of thin stock. The latter trouble, which is illustrated in Fig. 6, is usually confined to material less than 1/16 inch thick. It is very difficult to clamp thicker stock tightly enough to prevent its slipping in the clamps and thus relieving the stress that tends to cause upsetting or buckling.

The accompanying table gives rule-of-thumb spacings for clamps used in holding various

Clamp Spacing Data for Atomic-Hydrogen Arc-Welding of Straight Butt Joints

Plate Thickness, Inch	Clamp Spacing, Inch	
	Clamp to Seam	Clamp to Clamp
0.020	1/16	1/8
0.040	1/8	1/4
1/16	3/16	3/8
1/8	5/16	5/8
5/32	5/16	5/8

thicknesses of material in butt joints during atomic-hydrogen arc welding. This table applies particularly to straight butt joints, as between two flat plates or in the longitudinal seam of a straight box section.

When long clamps (requiring considerable depth to have the necessary stiffness) are used, it may be impractical to adhere to these recommendations, but they should serve at least as a starting point for the designer.

There are some cases, particularly in the welding of tubing and in welding spherical parts with an equator joint, where the expansion of metal between the clamps, due to the heat of the arc, can be used to advantage, especially in inert-gas shielded and atomic-hydrogen arc welding. By allowing sufficient space between the clamps to permit considerable expansion, and by making the clamps unusually rigid, it is often practical to secure sufficient upsetting of the molten and plastic material to obtain reinforcement of the joint, top and bottom, without the addition of any filler material, either in the form of wire or in the form of a flange or thickened edge on one or both of the parts.

Use of Chilling Bars

The basic principle underlying chilling is to obtain uniform, controlled heat flow. In order to accomplish this, three factors are essential: First, very nearly line contact of the chill bar with the work (Fig. 7), in order to fix accurately the point at which chilling occurs; second, uniform contact of the chill bar with the work, and preferably with uniform pressure, in order to control accurately the speed with which heat will flow from the work into the chill bar; third, uniform temperature of the chill bar, in order to obtain uniformity in the chilling effect.

Fusion welding depends on a critical balance between the heat input and the heat outflow from the joint being welded. With machine welding utilizing automatic arc length control, and with uniform welding current, the heat input in units per second is substantially constant when welding is progressing. It follows that the heat flowing out from the joint must also be uniform in units of heat per second. If the heat outflow increases, poor fusion will result, and if it decreases, overheating, with the likelihood of burning a hole in the work, will result.

When the mass of the work is relatively large, the chilling is usually sufficiently rapid and uniform by reason of the heat storage capacity of the work itself. On thin stock, however, such as 3/16 inch and under, chilling by means of chill bars is frequently required, particularly where rapid welding with consequent high rates of heat input is involved. The action of the chill in this case might be likened to that of a flywheel, or a heat sponge, since its effect is to smooth out differences in heat outflow which would otherwise be caused by variations in fit, joint preparation, and thickness and temperature of the stock.

The concluding installment of this article, to be published in December MACHINERY, will deal with the use of backing in machine arc welding, magnetic control of the arc blow, and the positioning of the electrode and the work.

* * *

Government Material for Sale

Raw and fabricated materials, standard parts, motors, hardware, fabrics, precision tools, equipment, and other surplus stocks are being offered for sale by the Army Air Forces. Companies interested in such materials and desirous of having their names placed on the active bidders' list are invited to write to the Army Air Forces, Air Technical Service Command, Midwestern Procurement District, Municipal Airport, P. O. Box 117, Wichita, Kan., attention of Property Disposal Section.

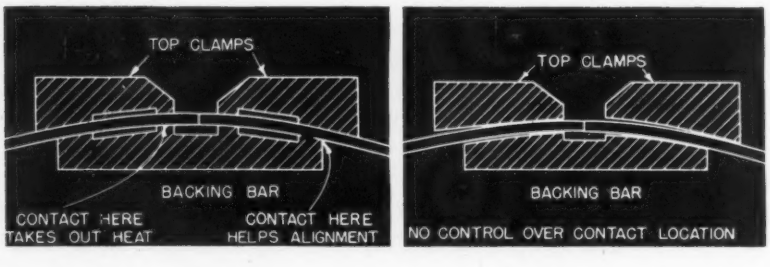


Fig. 7. When Chilling is Critical, Best Control can be Obtained by Accurately Determining the Points of Contact of the Chill Bars with the Work. The View at the Left Shows Correct Practice, and the View at the Right Shows Incorrect Practice

Low-Temperature Silver Brazing Used in Making Chemical Mortar Shells

By COLONEL HARRY R. LEBKICHER, Commanding Officer
Chicago Chemical Warfare Procurement District

THE Chemical Warfare Service is one of the important branches of the American armed forces. While its work is known in a general way to the Army and the public alike, strangely enough, outside of those actually working in and with the Chemical Warfare Service, almost everyone thinks of it in terms of one factor alone—gas. In actual fact, however, chemical warfare is concerned with a large number of munitions, and has control not only of the procurement of these munitions, but also of the training of troops in their use.

Army Specification Numbers and Corresponding Commercial Silver Solder Alloys

U. S. Army Chemical Warfare Service Spec. Numbers, 196-13-80	Brazing Alloys and Silver Solders Corresponding to Standard Specification Numbers	Silver Content of Alloys, Per Cent	Flow Point, Degrees F.
3	Sil-Fos Brazing Alloy	15	1300
4	Easy-Flo Brazing Alloy	50	1175
5	Easy-Flo No. 3 Brazing Alloy	50	1270
0	AT Special Silver Solder	20	1500
1	DE Silver Solder	45	1370
2	Easy Silver Solder	65	1325

Among the many items that are under the charge of CWS are the gas mask, the 100-pound incendiary bomb, the 4.2 mortar and the 4.2 shell, the M-15 hand grenade, the M-54 incendiary bomb, and the flame thrower. The manufacture and delivery of this equipment has been an enormous undertaking, but has been successfully met by the combined efforts of the engineers of the CWS and the metallurgists in industry.

In the making of the 4.2 chemical mortar shell for the American armed forces, the low-temperature silver brazing process plays an important part. The silver brazing alloys contain from 15 to 65 per cent silver, as shown in the accompanying table.

Briefly, the basic requirements in silver alloy brazing are two: (1) The joint surfaces must be chemically clean, and (2) the joints must be thoroughly fluxed. These brazing alloys, like other metal-joining mediums, will not flow properly unless the surfaces are perfectly clean. The application of flux prevents atmospheric oxidation at the joined surfaces, and at the same time, reduces the surface tension of the brazing alloy, permitting the molten metal to flow freely into all parts of the joint.

In silver brazing, the temperature should not be permitted to rise above the required point. Overheating is wasteful and may often be harmful. On the other hand, insufficient heat

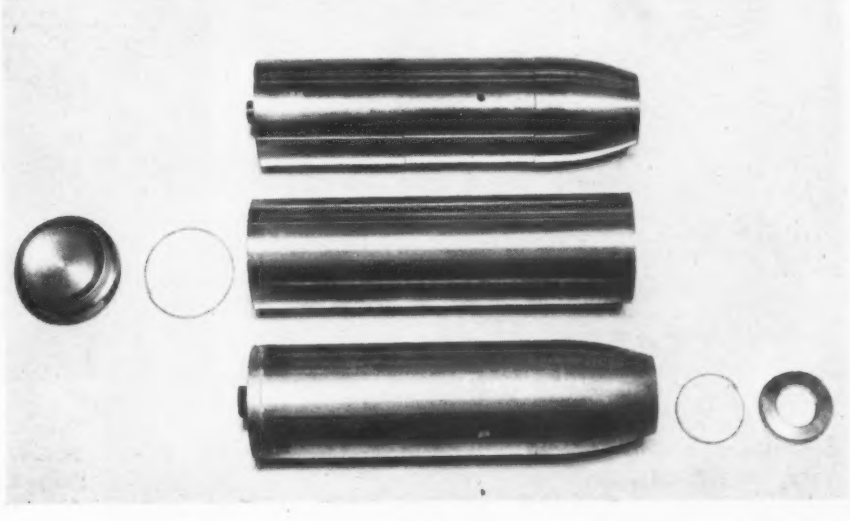


Fig. 1. Views Showing Finished Shell at Top, Shell Body and Base in Center, and Body and Adapter at Bottom

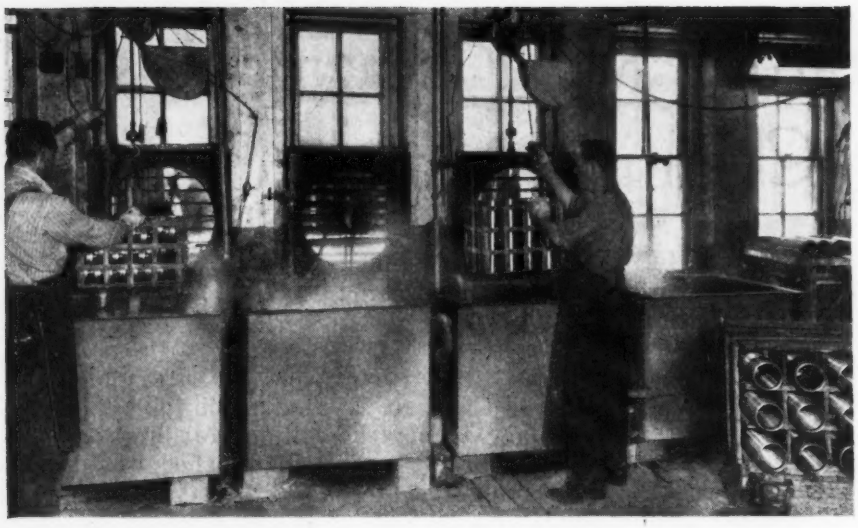


Fig. 2. Before Brazing, Bases and Bodies are Thoroughly Cleaned in a Hot Oakite Solution to Remove All Grease, Oil, or Dirt

is equally objectionable, because the alloy may "ball up" instead of flowing freely, in which case it is necessary to stop heating the parts, apply fresh flux, and then resume the brazing operation by reheating. The heat should always be concentrated on the part being brazed.

Silver brazing by means of a torch is an easy operation for one who has had previous experience in welding by fusion. Silver brazing by electric heat or in the muffle furnace can be done by semi-skilled or practically unskilled workers.

The 4.2 chemical mortar shell (Fig. 1) consists of a body with a base at one end and an adapter at the nose end, both brazed to the body by means of Easy-Flo brazing alloy. This alloy is placed in ring form in the joint area. The illustration shows at top the completed 4.2 mortar shell with base and adapter brazed in place and finish-formed and turned. The joints are not visible to the naked eye after finish-turning, but under a magnifying glass the fine line of brazing alloy is visible. The view in the middle of the illustration shows the shell body as it appears before the brazing operations and before the nose has been formed and turned. The base is brazed to the shell body first with the

Fig. 3. A Ring of 1/16-inch Silver Solder Wire, 4 Inches in Diameter, is Slid over a Metal Cone onto the Recessed Part of the Base

Fig. 4. Next, the Base with the Silver Solder Ring in Place is Given an Even Coat of Flux. A Glue Pot is Used to Keep the Flux Hot

Fig. 5. The Shell Body is also Provided with a Coating of Flux before the Base with the Silver Solder Ring is Inserted in it

Fig. 6. Base and Body are Heated in Tocco Induction Heating Furnaces. The Clamp at Top of Each Shell Applies a Slight Pressure

fine silver-brazing alloy ring shown. At the bottom of the illustration the shell is shown with the base brazed in place and the nose formed, ready for brazing the adapter to the nose.

One of the important makers of these shells is the Erie Basin Metal Products Co., Inc., Elgin, Ill. This company uses induction heating units by means of which a shell is brazed in approximately 1 1/2 minutes. There are practically no rejections. The cycle of operation as applied in the plant mentioned is as follows:

1. Clean shell body in hot alkaline solution (Fig. 2).
2. Dry inside of body by blowing compressed air through it. Then wire-brush inside and blow compressed air through it again (Fig. 9).
3. Place Easy-Flo ring, 1/16 inch thick by 4 inches in diameter, on base of shell (Fig. 3).

Fig. 7. The Shells Pass on a Conveyor from the Brazing Furnaces to a Storage Place where They Cool off. They Then Pass through a Machine where the Nose of the Shell is Formed and Later Machined, Ready for the Next Brazing Step

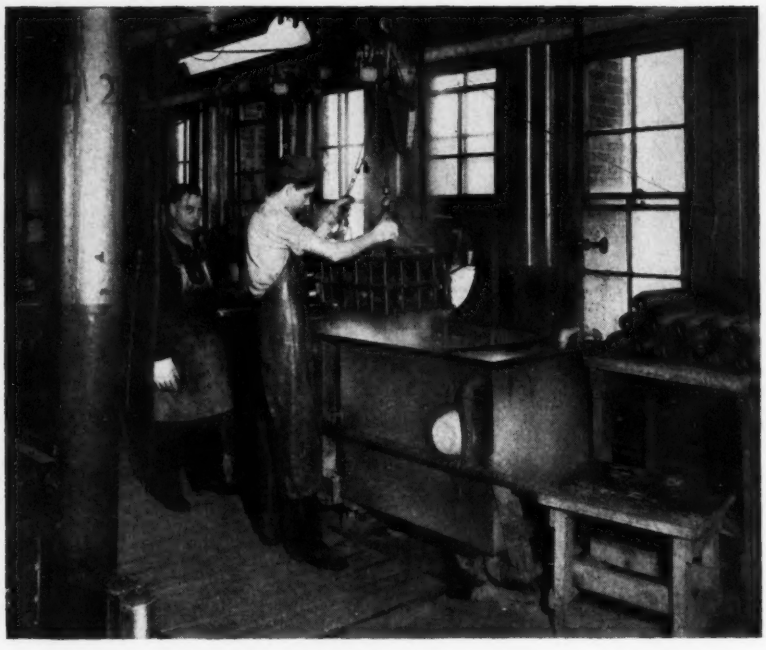


Fig. 8. The Intervening Forming and Machining Operations Make a Second Cleaning Operation Necessary to Remove All Oil, Chips, and Dirt

4. Apply flux to base and ring (Fig. 4).
5. Apply flux to inside of shell body at base end (Fig. 5).
6. Insert base in shell body.
7. Set work vertically in Tocco induction heating units, with base end in the heating field. One man serves two stations, each of which accommodates two shell bodies (Fig. 6). The clamp at the top of each shell applies just enough pressure to assure that the base settles accurately in place when the silver solder melts and flows.
8. Switch on current by push-button. Time of braze, 1 minute 35 seconds for two shells.

The shells are now carried by a conveyor to a storage place, where they cool off (Fig. 7). Then they are carried to a machine where the nose of the shell is formed. After being machined to accurate shape, the shells are ready

Fig. 9. The Shell Bodies, while Hot from Cleaning, are Blown out to Remove any Foreign Material and to Dry Them

Fig. 10. Rings of Silver Solder are Snapped onto the Adapters, and Flux is Painted over the Ring and Brazing Surface

for the adapter brazing operation. First, however, they are cleaned again (Fig. 8), as in steps (1) and (2). The adapter is then assembled to the nose end of the shell as follows:

1. Place a ring of 3/64-inch Easy-Flo wire, 2 3/4 inches in diameter, on adapter.
2. Apply flux to adapter and ring (Fig. 10).
3. Apply flux to shell body inside of nose (Fig. 11).
4. Insert adapter in the nose of the shell.
5. Place in induction heating units. The shell is held vertical, with the nose in the heating field. There are two heating units at each heating station. Each unit holds two shells and one man serves two stations. The operator loads the second station while the shells at the first station are being heated. The brazing time is 1 minute 40 seconds for two shells, and the whole operation of cleaning, applying the brazing alloy, fluxing, and heating averages 2 minutes 15 seconds.
6. Test for leaks under water at 250 pounds for 60 seconds.

Silver, copper, zinc, cadmium, and phosphorus are the major elements in low-temperature silver brazing alloys. The tensile strength of these alloys varies from 40,000 to 60,000 pounds per square inch, and it is said that they produce joints with a tensile strength considerably above these figures. When the thin films flow between the metals to be joined, the joint strength usually equals that of the metals joined. The electrical conductivity, in properly made joints, usually exceeds that of copper; the color ranges from yellow to white.

Among the advantages of silver alloy brazing, aside from low melting temperature, is the ability of the joint to withstand shock and constant vibration. These properties, together with the high electrical conductivity of the silver alloys, have resulted in the widespread use of silver-brazed joints in airplanes, shells, guns, and many other types of war equipment. While only a very small amount of the alloy is used for each brazing operation, the total quantities involved in war work are astounding. Between four and five million ounces of Easy-Flo alloy were used in the manufacture of twenty million incendiary bombs alone.

* * *

New Flux for Use in Tinning Cast Iron Prior to Brazing

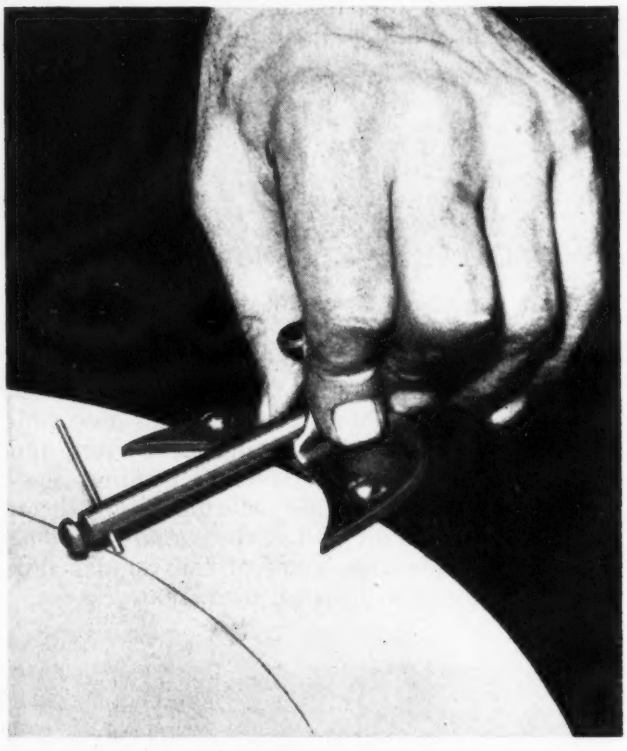
A flux designed to promote uniformly successful tinning of cast iron prior to brazing, known as Airco Hi-Bond, has been brought out by the Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y. This flux overcomes the difficulties encountered in tinning cast iron and makes possible highly satisfactory tinning, especially of cast iron of high carbon and silicon content, or low combined carbon analysis. The flux does not take the place of the regular flux used for the actual brazing operation.

Fig. 11. The Next Step is to Paint Flux on the Nose of the Shell Body and Insert the Adapter Provided with the Silver Solder Ring

Fig. 12. The Assembled Units are Now Heated and Brazed in an Induction Furnace, with the Heating Timed and Shut off Automatically

Radial Scratch Gage

For scribing cylindrical and circular parts that do not have a center section, lay-out men at General Electric's Schenectady Works save time by using the easily made radial scratch gage illustrated. This device consists of a flat plate with two guide pins underneath and a center piece on the top which holds a slide-arm. The scriber at the end of the slide-arm can be adjusted for height. The gage will scribe a circle



Method of Using Radial Scratch Gage to Scribe Circle a Given Distance from the Machined Edge of a Circular Disk

from a machined inner or outer diameter. A temporary center used in the conventional way for laying out such parts is unnecessary when this tool is employed.

* * *

Arcometer for Laying Out or Spacing Operations on Circular Work

An instrument for such operations as spacing or laying out bolt holes on circular work and similar applications was described in September, 1942, MACHINERY, page 212. This device is now being manufactured for the market by the Peterson Precision Instrument Co., 10144 S. State St., Chicago 28, Ill. By the use of this instrument, many of the measurements ordinarily required in laying out work are eliminated.

Some Management Problems

At the opening session of the Plant Management Conference, recently held by the National Metal Trades Association, Whipple Jacobs, president of the Belden Mfg. Co., Chicago, made an address on "Management Looks Ahead," in which he emphasized the importance of industry's endeavoring to solve its own problems without turning to the Government for help. He suggested that comprehensive educational programs on the advantages of the free enterprise system be carried on. He also called on the Administration to scrap needless controls and to institute sane and scientific fiscal and tax policies to encourage business men and industrial leaders to undertake the necessary industrial financing to insure steady employment.

He declared that the Administration's emphasis on price control for averting inflation is primarily intended to fasten the Government's grip on the nation's economy. While some limitation on prices will be necessary for a short period, industry should be allowed to so price its product as to insure incentives for production.

He further emphasized (what every schoolboy ought to know, but what our politicians and labor leaders overlook) that jobs can come only as a result of sales of goods and services, and that adequate job opportunities are only a by-product of a well adjusted individual enterprise system.

* * *

National Safety Congress and Exposition

The thirty-third National Safety Congress and Exposition, held at the Sherman, Morrison, and LaSalle Hotels, Chicago, October 3 to 5, covered an exceptionally wide range. A great number of papers were presented on safety methods and precautions in aircraft manufacturing and air transport, automotive and machine shop plants, construction and metal industries, and almost every other branch of industrial endeavor. A special session was devoted to industrial health, and another to employe publications. The Congress and Exposition was held under the auspices of the National Safety Council, 20 N. Wacker Drive, Chicago 6, Ill.

* * *

The National Bureau of Standards, Washington 25, D. C., has published a booklet entitled "Dial Indicators for Linear Measurements," giving information relating to the Commercial Standard CS(E)119-45 which has been adopted for this type of measuring devices. The standard becomes effective for new production January 1, 1945.

The Use of Rubber in Conjunction with Press Tools

Effective and Economical Methods of Producing a Wide Range of Sheet-Metal Parts — Last of Three Articles

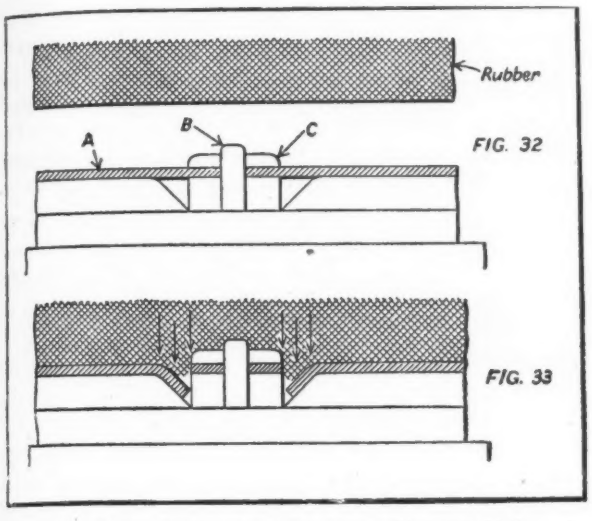


Fig. 32. Set-up for Piercing a Flanged Hole
Fig. 33. Result Obtained with Set-up in Fig. 32

IN the first two articles in this series the properties of rubber that affect its use in connection with press tools were discussed, and the manner of its application was explained. Shearing and piercing operations performed with the aid of rubber were also considered. This article will deal chiefly with the use of rubber presses for bending and flanging operations.

In dealing with the question of effective area, it was mentioned that the downward force of the mass of rubber adjacent to the solid portions of the set-up was neutralized by the upward resistance of the support. It should be borne in mind, however, that the whole mass, when in compression, is a source of energy that can be tapped at any point.

The amount of energy needed to perform a job on the rubber press is governed solely by the effort necessary to accomplish work where there is least effective area available. In other words, if it were desired to cut out a rib or similar member with, say, a dozen large lightening holes and one clean hole of 1/2-inch diameter, then the amount of effort necessary would be based on the energy needed to punch the 1/2-inch hole.

In piercing flanged holes, clean-cut edges are essential; otherwise cracks and splits may be expected to develop. When properly used, the rubber press process is ideal for producing flanged holes. Consider the set-up shown in Fig. 32, in which a flanged hole is required in the plate *A*. The hole is located by the pin *B*, which also serves to retain the pressure pad *C* in position. It will be seen that the recess, which leaves unsupported enough metal to furnish a sufficient effective area, has solid walls that serve a dual purpose. They not only act as boundaries to confine the effective area within suitable limits, but serve at the same time as formers to receive the cut metal. The effective area is indicated by the arrows in Fig. 33, which also shows the result obtained. A pressure of one ton per square inch would be sufficient to produce a flanged 9/16-inch hole by this method in a sheet of duralumin 0.022 inch thick.

Bending or Forming Small Flanges or Lip Formations

The production of small bends and turnovers may be regarded as among the most difficult rubber press operations, and designers should always bear this fact in mind. In many cases, turnovers can only be effected by the application of a pressure which, although it could be ob-

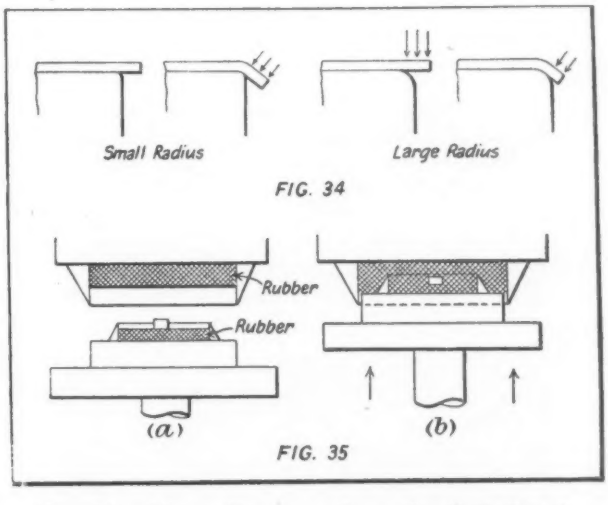


Fig. 34. Views Showing why a Small Radius is Preferable to a Large Radius for Forming Small Flanges. Fig. 35. A Typical Set-up Employing an Auxiliary Rubber Bed

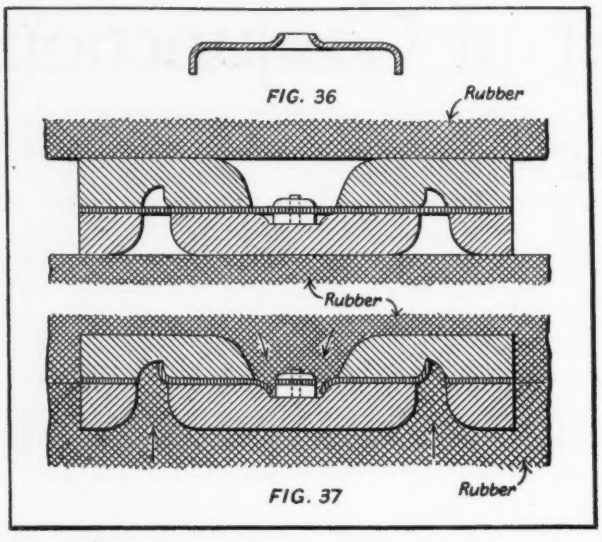


Fig. 36. Sectional View of Part that Requires Flanging in Two Directions. Fig. 37. Set-up for Producing the Part Shown in Fig. 36

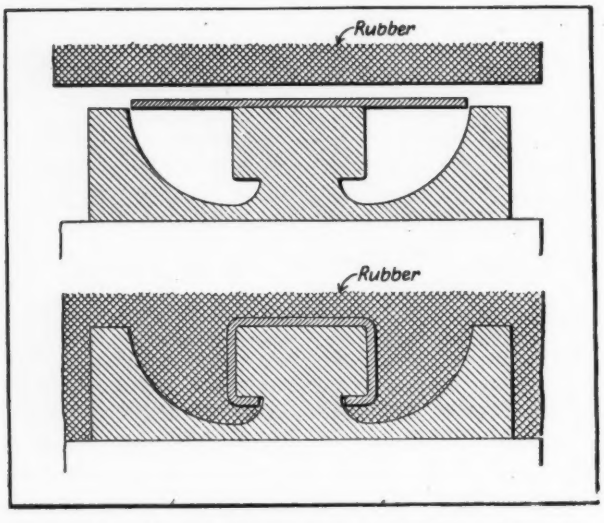
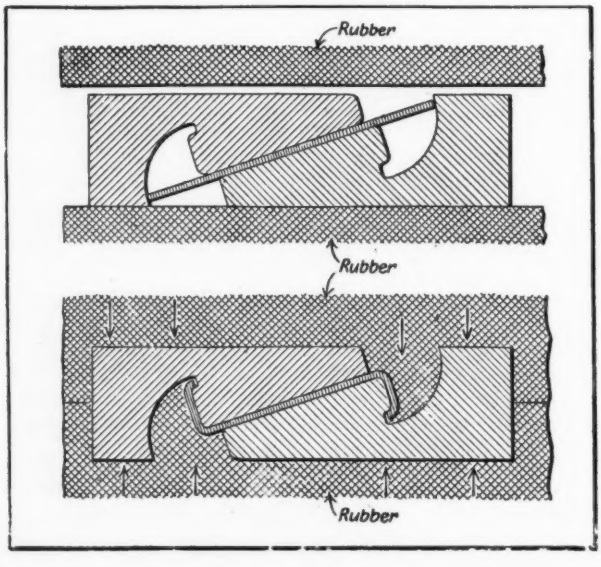


Fig. 38. (Above) Set-up for Producing a Straightforward Double Bend



tained by reducing the area of the rubber bed, would have a very harmful effect on the structure of the metal itself, due to crushing. It is advisable that, for small turnovers, the bend radii should be as small as possible. This is necessary in order to maintain, as long as possible, a reasonable effective working area, as shown in Fig. 34.

As a general rule, flanges and lips should be at least equivalent to three times the gage of the metal being worked on, and, as already stated, bend radii should be kept to a minimum.

Flanges and Bends in Opposite Directions

Up to this point, attention has been confined to cases in which all work done has been accomplished by the metal giving way to the natural flow of the rubber mass. In many instances, however, parts are so designed that there is no alternative to forming flanges and lips in opposite directions. This calls for directional effort immediately opposed to that of the mass of rubber.

Such work may be done on the rubber press in two ways. First, it may be carried out in two or more operations, the portions already finished in the first stage being shielded from further pressing action while the subsequent stage or stages are being completed. Second, it may be executed in one operation by the use of an auxiliary rubber bed.

The secondary rubber bed can be set up as shown in Fig. 35, and provides virtually a double rubber mass. By carefully screening or shielding the work done by each individual mass, simultaneous cutting and flanging of a part in opposite directions becomes a relatively simple matter.

Consider, for example, the metal fitting, a sectional view of which is shown in Fig. 36. This calls for a small flanged hole and two lips at the outside edges which must be formed in a direction opposite to the flange around the hole. It would be advisable in this case to complete the job in one operation with the aid of a set-up such as shown in section in Fig. 37. It should be noted that combined cutting and flanging operations are only advisable where the flanges or turnovers are relatively small, as in this instance.

Double flanging operations present no special difficulties, provided care is taken in the design of the outer barriers of the forming tools. Typical designs are shown in Figs. 38 and 39. The first of these shows a straightforward double bend, while Fig. 39 shows a lay-out for double flanging in opposite directions.

Fig. 39. (Left) Set-up of Rubber Press for Double Flanging in Opposite Directions

External versus Internal Forming Operations

It is advisable, in the design of tools for forming, to arrange for the bending operations called for to be accomplished by means of external and not internal pressure. In other words, forming should take place over a projection rather than into a recess. This is advisable for two reasons. First, external bending tends to eliminate waste of effort in overcoming the friction experienced in internal forming, and facilitates the production of consistently accurate forms. Second, less effort is needed in general for external bends than for internal forming.

To illustrate the first point, consider the production of the metal detail shown in section in Fig. 40. The dimension x in this example may be taken as three times the dimension y. The work can be attempted by either the external or internal application of pressure, and tools for each method are shown in Fig. 41. The views at A show the result of unbalanced pressure areas, as indicated by the arrows, while the views at B show how, with correct tool design, it is possible to trap the metal during operation and thus insure correct registration.

To clarify the statement that less effort is required to produce a given result by means of external rather than internal pressure, let it be assumed that a piece of sheet metal is to be bent through an angle of 90 degrees. If external pressure is applied with a forming block, as shown in Fig. 42, relatively little effort is necessary, because of the even distribution of the load about the distances x during the whole of the operation. Moreover, a close fit will be obtained around the fulcrum point A, irrespective of whether it has a small or a large radius. On the other hand, a bend obtained as shown in Fig. 43 calls for localized effective pressure during the latter part of the forming operation (see arrows), and it will be found impossible to obtain good sharp bends in this manner.

In cases where internal folding is required in conjunction with other formations, it is advisable to consider recourse to an additional operation, bearing in mind that an additional stage does not necessarily involve much loss of time where rubber presses are concerned.

Flanges on Edges with Curved Contours

The one disadvantage that prevents the rubber press method from being universally adopted is its inability to "lose" metal. This makes it impractical to attempt flanging of a convex nature, as such an operation often calls for the "losing" of metal to a considerable extent.

If the contour desired is not particularly sharp, or the turnover not too deep, a reasonable amount of success may be expected, as in such instances, the amount of metal to be "lost" is negligible. Concave bends, on the other hand, present no difficulties, as they call solely for stretching of the metal, for which the rubber press process is peculiarly adapted.

Consider the forming of a part such as the nose-rib shown in Fig. 44 with the aid of a forming block. The initial pressure of the rubber would give a turnover of a wavy nature, as seen at X, the waves being caused by the excess

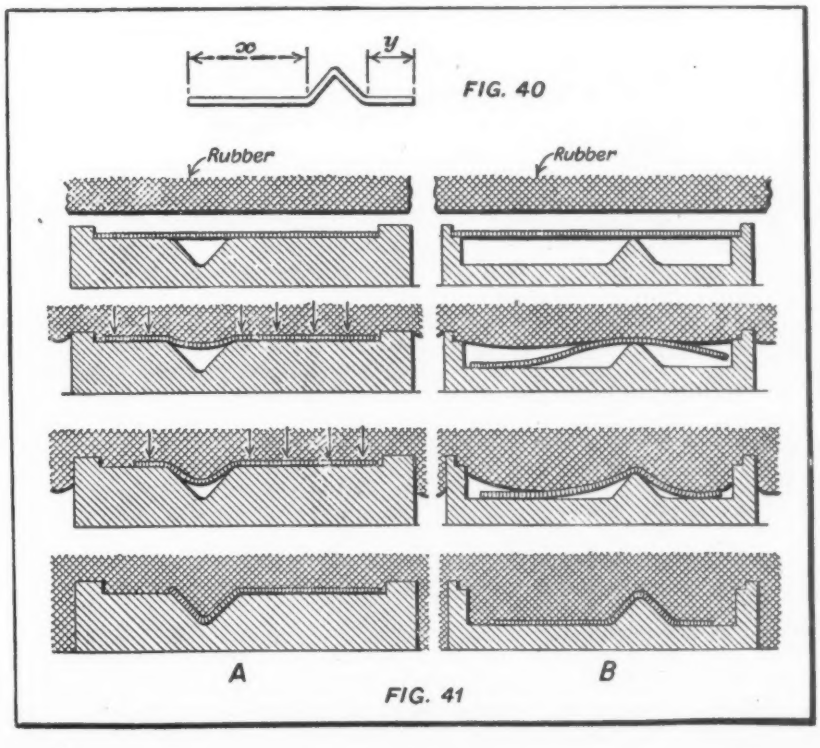


Fig. 40. Component Requiring a V-bend. Fig. 41. (A) The Part in Fig. 40 Cannot be Produced Satisfactorily by Internal Pressure as Illustrated Here. (B) The Required Result Can be Readily Obtained by External Pressure as Here Shown

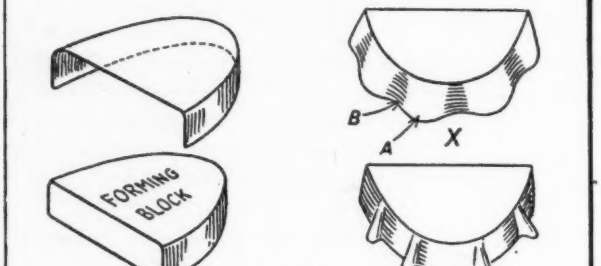


Fig. 42. Forming a V-bend by External Pressure
Fig. 43. Forming a V-bend by Internal Pressure
Fig. 44. A Shape for which the Rubber Pressing Process is Unsuitable

metal. No subsequent application of pressure would eradicate the high points *A*. This is easily understandable when it is realized that any pressure applied to reduce the high points is at the same time being applied at the low points *B*. Furthermore, additional collapse of the metal would give increased effective pressure areas at the points *B* and correspondingly smaller effective pressure areas about the points *A*. The result under these conditions would invariably be similar to that shown at *Y*.

The Rubber Bed

It is not proposed to discuss the enclosing framework in this article, as the design is simple and depends on the size of bed required and the amount of pressure to be used. As regards the rubber bed, itself, the thicker it is, the better will be the result. It is recommended that the thickness be from 6 to 10 inches. Certainly, it should not be less than 6 inches, especially if the use of a double rubber bed is contemplated, in which case 10 inches is preferable. The surrounding structure for the secondary rubber bed need not be nearly so rugged as that for the main bed, and from 3 to 4 inches thickness of rubber should meet most requirements.

In cases where drag is likely to occur, it will be found helpful to dust the surface of the metal that is to come into contact with the rubber with French chalk or any other very fine non-abrasive powder. Care should be taken to insure that no minute particles of metal or scale are left adhering to the rubber, as such particles are likely to scratch the metal and prevent the attainment of clean cut edges prior to flanging.

Norton Motion Picture — Grinding Carbide Tools

The latest addition to the industrial training films issued by the Norton Co. covers the subject "Grinding Carbide Tools." This is the fifth film in the series entitled "Lessons in Grinding," the previous films being "Cutter Grinding," "The Cylindrical Grinder," "The Surface Grinder," and "The Grinding Wheel—Its Care and Use."

The new film was produced with the assistance of experienced demonstrators, and incorporates modern shop methods in the regrinding of carbide-tipped tools. It covers the best practice with both Crystolon and diamond wheels. It pictures the grinding of dull tools, the reconditioning of broken tools, the grinding of chip-breakers, the grinding of carbide-tipped scrapers, the resharpening of reamers and face mills, and other similar operations.

The films produced under the heading "Lessons in Grinding" are on 16-millimeter Kodachrome stock with sound track. They require from fourteen to thirty minutes to show. They are intended for classroom use. It is preferable to show one film at a time, and follow the film with a discussion by an instructor and questions from the audience. They are lent without charge to industrial plants for apprentice classes or groups of workers, as well as to technical societies, engineering schools, or similar groups. For further information, address the Norton Co., Publicity Department, Worcester 6, Mass.

* * *

Winchester Honors Employes of Long Service

The Winchester Repeating Arms Co., New Haven, Conn., recently honored 824 employes who have worked for the company from twenty-five to sixty-two years each. These men represent 20 per cent of the company's peacetime employes. Of the men honored for long service, twenty-six have been with the company fifty years or more; seven, over fifty-five years; one, sixty-one years; and one, sixty-two years. Long service records like these speak well both for the employer and for the employes.

* * *

Gearing Industry Still Very Active

The gearing industry, as reported by the American Gear Manufacturers Association, shows an increase in volume of sales for August, 1944—the last month for which complete reports are available—of 2.1 per cent, as compared with July. These figures do not include turbine or propulsion gearing.

Basic Requirements for Post-War Employment

The attitude of the Government toward free individual enterprise, the willingness of those able to invest in industry to take risks under somewhat unfavorable conditions, and the attitude of workers toward productive efficiency are all important factors in insuring full and permanent employment in post-war years.

Stevenson, Jordan & Harrison, Inc., management engineers, list the basic essentials for employment and productive efficiency after the war as follows:

1. Technological progress must be continued.
2. A sufficient volume of risk capital must flow into business.
3. Prices must be kept at the lowest level that is possible without reducing labor's purchasing power through reduction of hourly rates of pay and without checking capital formation and investment because of a serious curtailment of business earnings. To accomplish this objective, unit labor costs must be kept as low as possible through increasing output per man-hour.
4. Confidence in the security of jobs and worker incomes, in investments, and in the value of money must be maintained.

What are the responsibilities of Government, management, and labor for bringing about these conditions? Few people will dispute the desirability of a policy of "more goods for more people at less cost," but there are differences of opinion as to the responsibilities of each group for achieving this result.

The fundamental test of good government, good management, good labor is simply this—Do their actions tend to increase production and to keep costs, prices, and individual incomes in proper relationship?

* * *

Unusual Grinding Operation on Aircraft Engine Starter Shaft

The design of the starter shaft of a Cyclone aircraft engine presents an unusual grinding problem. The shaft is over a foot long and carries near one end a narrow counterbored flange. It is required to grind the counterbore diameter and a circular recess at the bottom of the counterbore.

This operation is performed by the Wright Aeronautical Corporation, Paterson, N. J., on a standard Heald internal grinder equipped with a hollow spindle. The work is chucked on the short end of the shaft, and tested to see that it runs true with a dial indicator. The long end of the shaft passes into the hollow spindle, while the grinding is performed with the periphery and end face of a ring type wheel mounted on the end of the spindle.

Hollow-spindle Internal Grinding Machine in which the Wheel Passes over a Shaft Integral with the Work-piece

Collet Chucks of Special Design

By DONALD A. BAKER

ANY piece of work that can be held in a chuck or fixture can usually be machined successfully, but sometimes the development of a suitable holding device becomes quite a problem. The design of the chuck or fixture may make all the difference between success and failure.

For instance, a bushing, such as shown at *A* in the accompanying illustration, which must be finished all over with a tolerance of 0.0005 inch on the outside diameter, 0.001 inch on the inside diameter and thickness, and 0.0015 inch on the indicator reading for concentricity and parallelism presents an interesting chucking problem. This was solved by designing the chuck as shown at *B*. The chuck illustrated at *C*—a conventional split type expanded by a draw-bar having a taper head—proved unsatisfactory for this work because of the uneven expansion of the split sections, which resulted in the production of parts that were neither concentric nor parallel.

The chuck shown at *D* gave very good results with reference to concentricity, as the draw-bar was guided at its outer end by the chuck body. This design served to overcome any tendency of the split chuck to expand unevenly. As a matter of fact, this chuck is being used in a great many cases where concentricity is of prime importance. However, in this case, it was discarded in favor of the somewhat unusual design shown at *B*. The latter chuck has several advantages over the ones shown at *C* and *D*. In order to use either of these chucks, it is first necessary to bore the hole in the parts. In the case of the chuck shown at *B*, however, this is not necessary.

In using the chuck illustrated at *B*, the stock is first cut to length on a milling machine, using gang cutters to cut off several pieces at a time. These pieces are then drilled on a drill press, using a quick-acting cam-operated fixture. With this type of fixture there is, of course, no assurance that the hole will be at right angles to the faces or that the faces will be parallel within close limits.

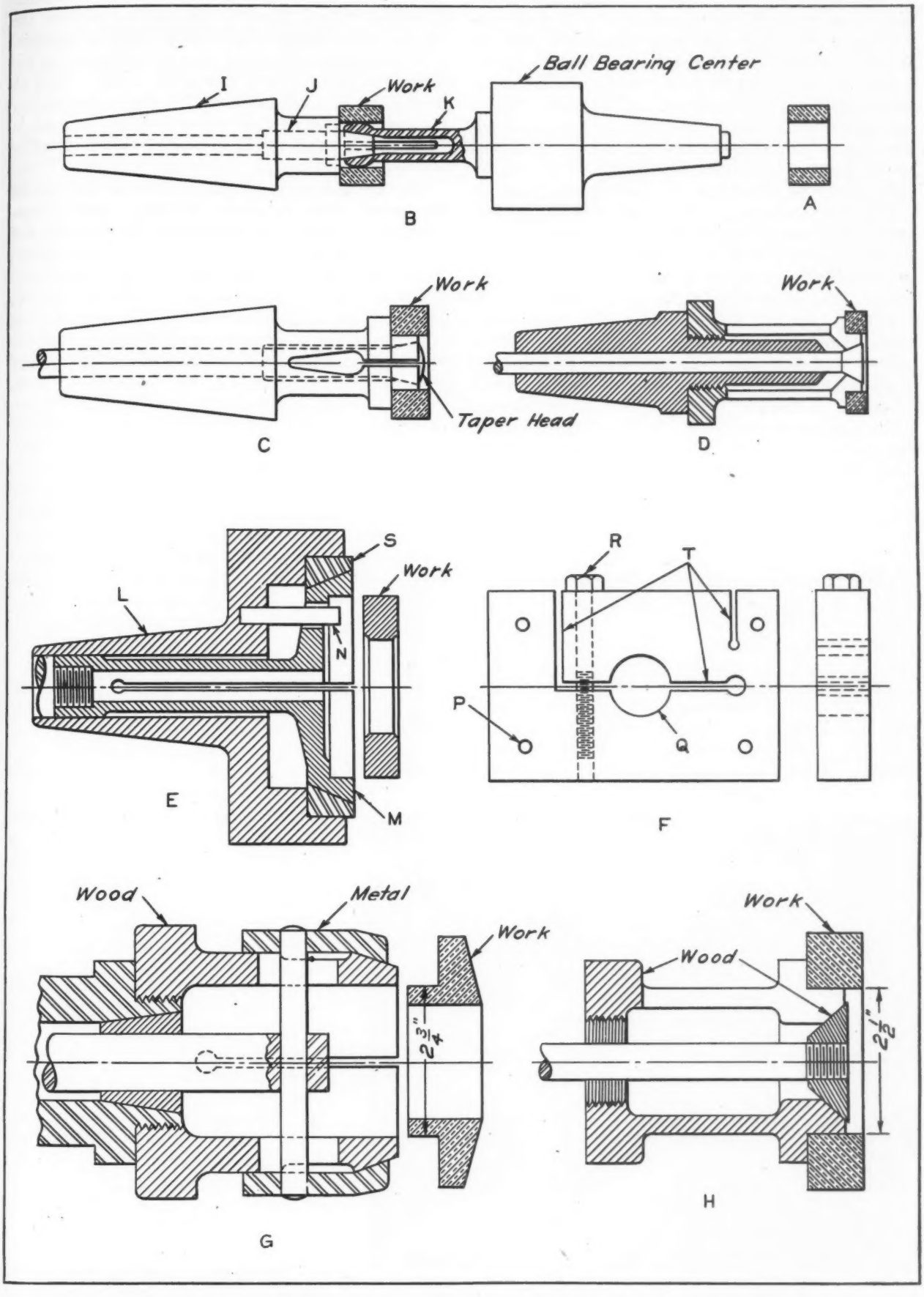
The first requirement of this chuck is that it hold the work firmly seated against the chuck face. If the bore of the work is not at right angles with the face placed against the chuck, the expanding member in the bore, when of conventional design, has a tendency to pull the part away from the chuck face. To prevent this from happening, an expanding member of unusual design was developed, which, although not designed originally to insure concentricity within specially close limits, has proved very accurate in this respect.

Referring to view *B*, the chuck body is shown at *I*. At *J* is a hardened drill-rod plug, the end of which is tapered to an included angle of 16 degrees. The tapered plug serves to expand the hardened mandrel *K*, which has three equally spaced slots and is mounted in a ball-bearing center. The end of the split mandrel that enters the work is ground on a slight radius, thus giving little more than a line contact inside the bore of the work. This design prevents any tendency of the mandrel to throw the work out of alignment with the axis of the spindle or cant it away from the face of the chuck. The work can be slipped part way on the mandrel, after which the mandrel is fed forward until the work strikes the face of the chuck. Contact of the work with the chuck serves to straighten it up or bring it into line with the spindle. Continuous forward movement of the mandrel serves to hold the work still more firmly against the chuck face while the mandrel is being expanded by the taper pin.

The stepped chuck at *E* is interesting for several reasons. First, it was produced in a shop that had no grinding facilities. Normally, body *L* would have been hardened and ground on both the outside and inside tapered portions. In the chuck shown here, however, body *L* is made of machine steel and left soft. A standard Timken tapered roller-bearing sleeve of suitable dimensions is pressed into place, as shown at *S*, to take the wear of the split collet. The split collet *M* is made of machine steel and left soft.

This chuck has been used in boring over 30,000 parts to very accurate dimensions and is still in good condition. Three equally spaced pins *N* are inserted in the chuck body and pass through the split collet. These pins serve to locate the work accurately when the closing action of the chuck draws the work back against the ends of the pins. This was necessary since, in this set-up, the work is first bored and then accurately chamfered on the edge of the bore.

The chucks shown in views *G* and *H* are also of rather unique design. These chucks were designed for holding large bronze pieces which were required to have a high polish. Metal chucks for holding these parts would have been expensive and would have had the disadvantage of marring the polished surfaces of the work. For this reason, the bodies of the chucks were made from hard wood.



Collet Type Chucks Designed to Meet Special Work-holding Requirements

The problem of finding a straight-grained hard wood for this purpose was solved by obtaining some worn-out and discarded pins of fine hard maple from a bowling alley. The maple bodies of these chucks were split in four equal parts like any conventional split collet. Their operation by a draw-bar and an external expanding head on the draw-bar in one case, and by an external sleeve in the other, will be readily understood by reference to the illustrations.

The chuck shown at *F* consists of a piece of hot-rolled steel in which saw cuts were made at *T* with a DoAll machine. This chuck is mounted on a suitable faceplate by means of screws and dowels that pass through holes *P*. The hole at *Q* is then bored to the proper size to receive the work, which is clamped in place by means of a bolt or stud and nut at *R*. Bushings can be used in the center hole to accommodate various sizes of work. Although this is a substitute or makeshift arrangement for a regular split chuck, very accurate work can be produced with it when the outside diameter of the piece is uniform and care is taken in boring hole *Q*.

* * *

Reversed Grinder Set-Up for Forming Master Cams

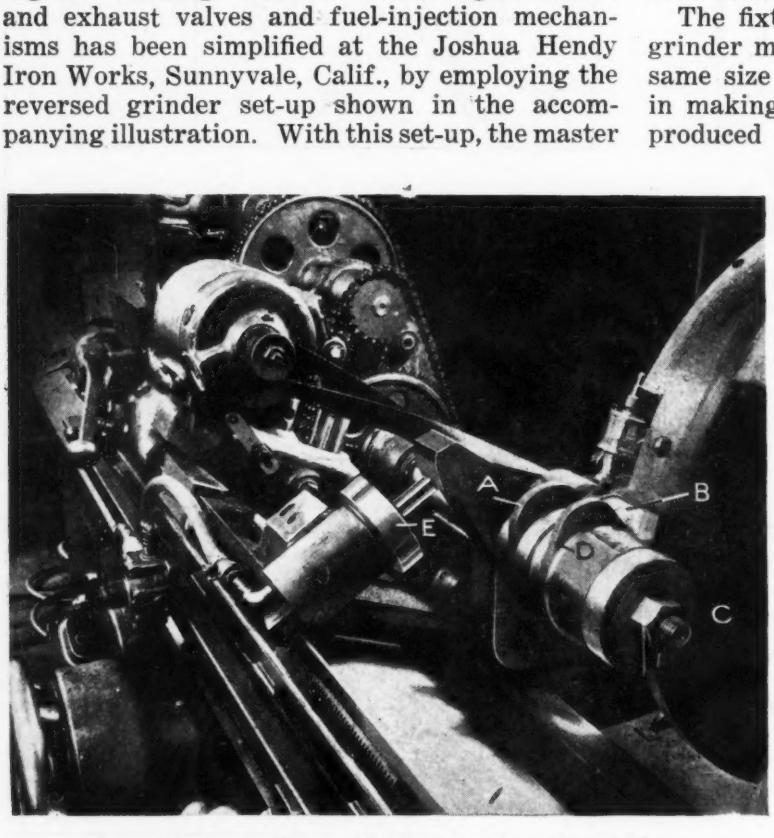
The making of master cams for use in grinding the working cams for Diesel-engine intake and exhaust valves and fuel-injection mechanisms has been simplified at the Joshua Hendy Iron Works, Sunnyvale, Calif., by employing the reversed grinder set-up shown in the accompanying illustration. With this set-up, the master cam *A* is ground by an attachment using a small grinding wheel *B* and spindle to replace the master rotor used in grinding the engine cams. A round steel disk *C* is also substituted for the large grinding wheel normally used. Disk *C*, operating in conjunction with the cam-grinding fixture, serves as the roller which is kept in contact with the working cam *D* when grinding master cam *A*.

The operating principle of the device, which has many other precision grinding applications, consists primarily of reversing the functions of the grinding wheel and rotor. When the device is set up, it requires only about two hours to cut the two master cams needed in the set-ups for grinding the working cams for the engines. The making of these master cams would ordinarily require hours, or even days, of careful filing and grinding—usually on the trial-and-error basis.

The working master cam *D* used with the set-up illustrated is filed to a tolerance of plus or minus 0.001 inch, and is kept in constant contact with the large disk *C* to form or control the shape of the master cam *A* being ground. The working master cam is kept in contact with the large disk under constant pressure by an air cylinder *E*. The master cam *A* to be ground is mounted on the same shaft with the working master cam *D*. The grinding is accomplished by a small size grinder, so mounted that its wheel *B* is in the position normally occupied by the master rotor.

The fixture is driven by a 1/2-H.P. Dumore grinder motor. The large disk *C* is exactly the same size as the grinding wheel normally used in making the engine cams. The master cams produced with this equipment are now being employed in the production grinding of Hendy Diesel-engine cams. This involves the grinding of eighteen cams, including six intake, six exhaust, and six fuel-injection cams. The intake and exhaust cams are identical in shape, and can therefore be made on the same set-up.

In production grinding the regular engine cams, the rotor replaces the small grinding wheel *B*, and the grinding is done with the large grinding wheel, which is mounted in place of the large disk *C*. The engine cam being ground is, of course, mounted in the position previously occupied by the working master cam *D*.



Reversed Grinder Set-up Used in Grinding Master Cams Employed in the Production of Diesel-engine Valve Cams

* * *

"Restraint of production" should become as reprehensible socially as "restraint of trade."

Cutting National Emergency Steels with Band Saws

By H. J. CHAMBERLAND

The table below will assist in increasing both saw life and cutting rates when sawing National Emergency steels Nos. 8024 and 8949 with band saws. These recommendations are based on data furnished by the DoAll Contour Saw Laboratory.

The average cutting time when these recommendations are followed will be from 1.25 to 1.75 square inches per minute. The highest cutting rate will probably be experienced in sawing material 3 1/2 to 4 inches thick if a 1-inch wide, 6 pitch, raker tooth, "A" temper saw is used with from 70 to 75 pounds feeding pressure. In this case, the cutting rate should increase to over 2 square inches per minute.

Recommended Saw Pitch and Saw Velocity for Sawing NE Steels Nos. 8024 and 8949

Material Thickness, Inches	Saw Pitch	Saw Velocity In Feet	Feeding Pressure
1/16 or less.	32–24	225	Light (hand)
1/16 to 1/2.	24–14	200	Light
1/2 to 1	14–8	175	Light-medium
1 to 2 1/2 ..	8	150	Medium
Over 2 1/2..	6	150	Medium-heavy

Kerosene is recommended as a coolant. A drip lubricator regulated to a flow of about 45 drops per minute is most efficient. The saw should be properly hardened to withstand the severe strains of heavy cuts. The hardness of the tooth should not bridge across the gullet, as in that case, minute cracks will form in the gullet due to the constant flexing of the band and the high tooth load when thick sections are cut.

A 1-inch wide saw is recommended for all thicknesses over 2 inches, and a 1/2-inch saw for thicknesses from 1/2 inch to 2 inches. In sawing a contour, the smallest radius will determine the width of the saw, but the widest saw consistent with the type of the contour should be used. The average saw life on these steels should be from 600 to 1000 square inches of material cut.

* * *

In the background of a prosperous economy, I think the whole problem comes down to whether the people of our country are willing to work for the things they would like to have. I think they are.—*C. E. Wilson, president, General Motors Corporation*

Standard Markings for Identifying Grinding Wheels

The desirability of a uniform system for marking grinding wheels has long been recognized by wheel manufacturers and consumers alike. An attempt to do this was inaugurated several years ago; and after a year's trial, it was submitted and subsequently approved under the procedure of the American Standards Association as an American Standard (B5.17-1943). There were, however, some reactions in industry that indicated certain shortcomings in this standard.

The committee of the Grinding Wheel Manufacturers Association assigned to study the subject is of the opinion that the principal reasons for difficulties with the American Standard were that confusion still existed and nowhere in the standard itself was it made clear that wheels similarly marked, if made by different manufacturers, might not grind alike.

Nevertheless, the grinding wheel manufacturers are agreed that much good can be accomplished by the use of a uniform system of marking, provided the limitations of the system are clearly understood; hence the Grinding Wheel Manufacturers Association, on March 16, 1944, approved standard markings for identifying grinding wheels and other bonded abrasives. The best points of the previous standard have been retained, and other features that had not proved entirely satisfactory were revised. The most important revision is the adoption of an alphabetical marking system for all bond types to designate grade of hardness. Better provision has been made for the wheel-maker to incorporate into the marking such special symbols as might be required to properly qualify the basic principles of the standard markings. A folder giving complete information of this system of markings is available from the Grinding Wheel Manufacturers Association, 27 Elm St., Worcester 8, Mass.

* * *

A New Material for Shop Floors

"Stonoleum," a material recently developed by the Continental Asbestos Refining Corporation, 1 Madison Ave., New York City, promises to become of importance in shop construction. This floor material is self-bonding and can be laid over old concrete, cement, wood, or composition floors without adhesives or separate bonding agents. The material is said to feel like rubber but wear like stone. An interesting feature of this material is that it is "self-filling"—small holes in the floor disappear as traffic moves for some time over the floor.

Engineering News

"Faxfilm"—A New Method of Surface Inspection

A new method for the inspection of machined or otherwise finished surfaces has been developed by R. D. McDill, 5109 Mayfield Road, Cleveland 21, Ohio. This method, known as "Faxfilm," is simple and inexpensive to use. By means of a solvent, the surface of a plastic film is softened sufficiently to permit the making of a contact replica of the surface to be inspected. This small piece of film is mounted in a cardboard frame which fits any standard projector, by means of which it can be enlarged 100 diameters or more. In this projection, all contours can be seen. The film can be filed for future reference if desired.

The advantages claimed for the method are that it is speedy, requiring less than a minute to make the impression; simple, no complicated instruments being necessary; inexpensive, the cost being estimated at 6 cents a piece for small quantities and less for large quantities; and accurate, as it is an exact replica of the surface.

Water- and Air-Proof Zippers Now Available

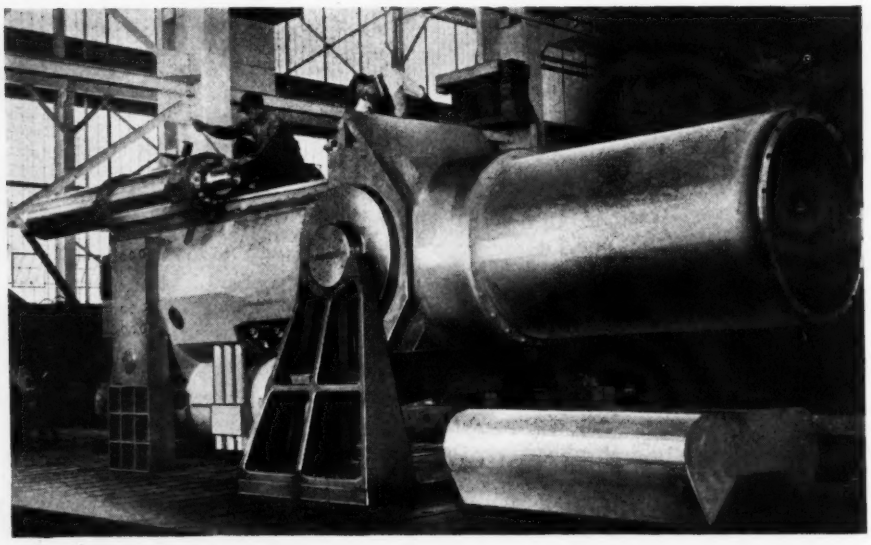
A unique rubber construction applied to metal slide fasteners or zippers that makes them completely waterproof and prevents the escape of air or gas has been developed by the B. F. Goodrich Co., Akron, Ohio. The new product is known as "Pressure Sealing Zipper." The construction consists of overlapping rubber lips that have such initial tension applied to them that they assure a perfect seal against any pressure which the structural strength of the slide fastener will withstand. Used on the outside of an article, they make it water-proof and prevent the entrance of air or gas; used on the inside, they prevent the escape of liquid, air, or gas contained in the article or vessel.

Method of Printing Drawings Directly on Metal

Materials for use in a simplified method of printing working drawings directly on metal have recently been announced by the Eastman Kodak Co., Rochester 4, N. Y. The materials are known as Kodak lay-out paint and lay-out paint primer. The latter is used as a base for the lay-out paint. The method has widespread applicability where flat metal parts are involved.

The primed metal surface is sprayed with a spray gun in ordinary room light with the lay-out paint, the surface having previously been cleaned reasonably free from loose dirt and grease. The paint dries rapidly and the prepared metal is now ready for immediate use or it can be stored for a reasonable time in a dark place.

To transfer a drawing directly to the metal surface, the drawing (which has been prepared with black ink on a transparent or translucent material) is laid in contact with the prepared surface, and an exposure of a few minutes duration is made in arc of mercury vapor light. The



Housing for the Recoil Mechanism of a 16-inch Naval Gun Nearly Ready for Shipment from a Naval Ordnance Plant that is Operated by the Westinghouse Electric & Mfg. Co.

drawing is then removed and the metal is flooded with warm weak ammonia water. A vigorous spray of ordinary water then follows to wash away the entire exposed coating, leaving white lines where black lines appeared on the drawing. A thin spray coat of the lay-out paint primer will protect the finished surface.

The parts so marked are as accurate as the original drawing. The lay-out paint withstands bending, shearing, and punching without showing any tendency to loosen, and will resist the application of a cutting torch up to the point where the molten metal carries it away, provided the metal does not scale.

The new method has the advantage over the scribing method that the instructions inked-in on the drawing are transferred to the part to be fabricated. Reductions in scrap loss are also possible, since the drawing can be so prepared as to include parts for several products, economically arranged. An inexperienced operator can learn to apply the process rapidly.

New Type of Torque Wrench Embodies "Sound" and "Feel"

A torque wrench that is the culmination of several years of research has been developed by the P. A. Sturtevant Co., Addison, Ill. This company, in the past, has made a torque wrench with an indicator and scale providing a visual reading to determine the applied torque. The new type embodies two additional features—"sound" and "feel".

A trigger finger is provided which can be set at any desired signaling point. Then when torque is applied to the wrench, at the exact instant the predetermined torque is reached, there is a loud and distinct click, and a definite impulse is transmitted through the handle to the hand. The visual scale is retained so that, through the application of three senses—sight, hearing, and feeling—the operator will automatically release his pull on the wrench even before his mind consciously directs this action.

Under-Water Resistance Welding Improves Weld Quality

At the East Pittsburgh Works of the Westinghouse Electric & Mfg. Co., under-water resistance welding has replaced many of the routine processes of soldering and brazing copper cable to terminals. This modification of welding has saved a considerable amount in production costs by increasing the output. It has also improved the quality of the finished product.

Essentially, the process consists of welding by using special tips and having a stream of water playing on the stranded wire near the electrode. Water is applied in a volume sufficient to cool the work and prevent oxidation at the weld.

Machines for this work are usually designed with one fixed and one movable electrode, a special jig being fastened around the stationary terminal to hold the parts firmly in their relative welding positions. Electrode tips as now used are made of carbon, molybdenum, and Cupaloy. Increased tip life is obtained by mounting them in water-cooled holders. For welds that do not require flux, Cupaloy tips with molybdenum inserts have been found most satisfactory. Carbon tips are required where flux is used. Inserts that contact the wire are grooved to prevent flattening the cable.

By means of a foot-pedal, the operator lowers the upper electrode to complete the weld. The machine is air-operated and is timed by electronic controls. The completed assembly can be removed immediately without the use of pliers or gloves.

This is not a Haystack, but a Pile of Valuable Stainless-steel Turnings that were Collected by the Salvage Division of the General Electric's Lynn River Works for Shipment to the Steel Mills

Editorial Comment

It is often said that the major responsibility of industry after the war will be the maintenance of a high level of employment. Statements of that kind do not reflect very deep thinking, because employment, as such, is not the chief responsibility of industry. Employment is simply incidental to the real service performed by industry to the community, which is to produce the goods required by the public as efficiently and at as low a cost as possible. In performing that service, industry offers employment to people able and willing to work; but the purpose of industry is not to create employment—it is to produce goods.

Industry's Job is to Produce Goods Efficiently

The prosperity and well-being of the nation, however, requires that everyone able and willing to work be usefully employed; and industrial leaders are the first to recognize and emphasize that fact. How can this be accomplished? Comparatively few have the enterprise and ability to employ themselves. Those with ability to create jobs must employ the others and plan their work; but this they can do successfully only if governmental policies pertaining to industry are cooperative rather than obstructive.

Industry must be given an opportunity to develop and expand, unhampered by excessive and unfair taxation and by unreasonable labor restrictions and regulations. If that is done, then, through the individual enterprise of men with courage and foresight, opportunities will be created for employment, because these men conceive of new things to produce and new methods of producing them. If we want full employment, we must give men who have the ability to create employment an opportunity to exercise that ability.

Don't Hamper Men who are Able to Create Employment

On the other hand, when governmental policies and methods of taxation discourage enterprising men from creating employment for others, how can the result be other than serious unemployment? Men of high standing in our Government have frequently called upon industry to create employment; but at the same time, through the policies that these men have inaugurated, those that are able to create employment for others have been discouraged and hampered. If the Government wishes to prevent unemployment, the first step is to encourage individual enterprise, for it is individual enterprise alone that creates useful and self-supporting employment.

In this connection, it should be more generally recognized that the responsibility for being employed rests principally with the individual. First, it is his duty to avail himself of the facilities offered by industry and by the community to train himself to perform some kind of work in a satisfactory manner; and then, if he has not the enterprise or ability to employ himself, he should at least exert himself to offer his services to whomsoever can make use of them. Industrial plants are not the only places where those services can be used; they can also be used on farms, in the distribution of goods, in transportation, and in many other places outside of industry. The responsibility for employment does not primarily rest either with the employer or with the Government; it rests with the individual himself.

Leaning on Government for a Job is Poor Policy

This brings us to the civic responsibility of the individual. If, when he goes to the polls to vote, he chooses men for public office who discourage individual enterprise—that is, who discourage men who have the ability to create jobs from using that ability in industry—then he has to that extent helped to cause unemployment. If he wants to see himself and everybody else fully employed, he must help to choose men who will cooperate with and encourage those who have the ability to create employment.

What we need is a little more fundamental thinking on the subject of employment.

★ ★

"The people in America demand a reduction of Federal expenditure. It can be accomplished by reducing the expenditures of existing departments; by abolishing many useless Commissions, Bureaus, and functions, and by consolidating many activities of Government."—Thus spoke Franklin D. Roosevelt in November, 1932.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Oscillating Motion with Positively Locked Rest Periods

By MICHAEL GOLDBERG

Two mechanisms designed to produce an oscillating motion with a rest period for the sliding member were described and illustrated in June MACHINERY, pages 181 and 182. Both mechanisms are driven by a continuously rotating shaft. One of them, employing elements of a Geneva motion, was used in place of a cam and follower to obtain a positive locking action without backlash and without relying on springs for proper operation. A double-contact cam, such as here illustrated, could be used to secure the same results. This mechanism is positive, self-locking, and has no backlash. It also has the advantage of requiring fewer and less complicated parts than the Geneva type mechanism.

Springs were employed in the design of the second mechanism, illustrated on page 182 of June MACHINERY, this being permissible because positive positioning throughout the cycle is not required. In this case, the same results could also be obtained with the double-contact cam and yoke follower shown in the accompanying illustration.

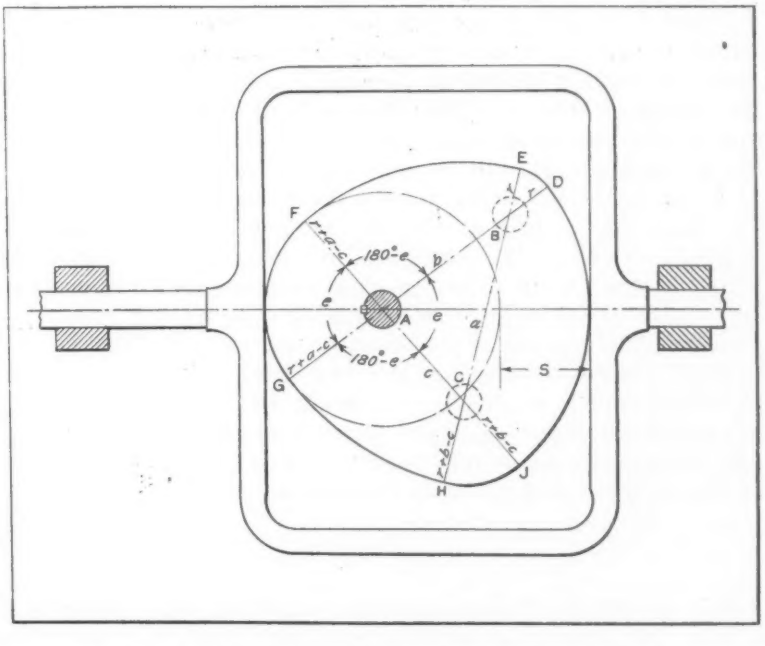
The cam of this mechanism is keyed to the driving shaft at *A*. The contour of the cam is composed entirely of arcs of circles, and is constructed as described in the following: Let *e* equal the angular magnitude of the two rest periods of the cycle. Then 180 degrees minus angle *e* equals the angle of the two action periods of the operating cycle.

Next, triangle *ABC* is constructed with angle *A* equal to angle *e*. The lengths *b* and *c* are then selected for two sides of the triangle, so that $b + c - a$ equals the length of the reciprocating stroke *S* of the yoke. Then, with the vertex of the smallest angle of the triangle as a center, say at *B*, and with an arbitrary radius *r*, construct the arc *DE*; next, with *C* as a center, construct the arc *EF*, and with *A* as a center construct the arc *FG*. With *B* as a center, construct arc *GH* and with *C* as a center, construct the arc *HJ*; finally, with *A* as a center, construct the closing arc *JD*.

The distance between any two parallel tangents to the cam is equal to the constant distance $2r + a + b - c$. Thus, the yoke follower maintains two contact points with the cam surface throughout the cycle, and operates without any backlash, except the small amount necessary for working clearances.

It will be noted that angles *B* and *C* are unequal, a fact that results in a different rate of acceleration or timing of motion on the forward and return strokes. Motion distribution or timing can be varied still further by changing radius *r*. Identical forward and return motions can be secured, if desired, by making angle *B* equal to angle *C*.

The shaft could have been keyed to the cam at points *B* or *C* as well as at *A*. In that case, however, a different rest period and a different travel of the follower would have been obtained with the same cam and follower, the rest periods

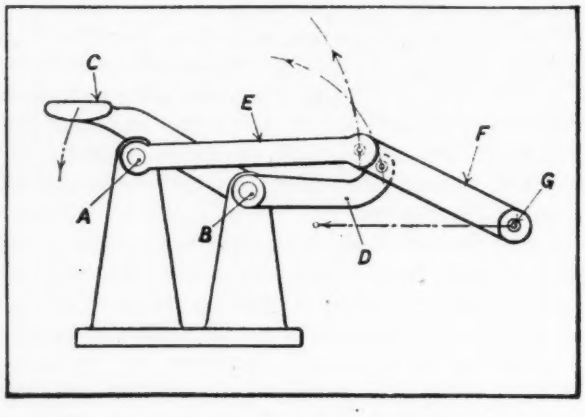


Cam Mechanism Designed to Produce Oscillating Motion with Positively Locked Rest Periods

corresponding in magnitude to the three angles *A*, *B*, and *C* of the triangle. The cam will operate with a rocker-arm follower as well as with a sliding type follower.

Simple Straight-Line Motion Mechanism

The accompanying illustration shows a mechanism designed to withdraw a slide horizontally in a straight line to permit a part to be dropped through the opening into a chute of a conveying system. For the long stroke required, this device is quite efficient and can be adapted to other mechanisms. It is foot-operated and can be constructed at small cost. The paths through which the various members travel when the pedal is depressed are indicated in the illustration.



Simple Foot-operated Mechanism for Obtaining Straight-line Motion

Pedal *C* is simply a continuation of lever *D*, which is pivoted so that it can be rotated freely about the center of stud *B*. Lever *E* pivots about the center of stud *A*. The other ends of arms *D* and *E* are connected by pivot-pins to the operating lever *F*. It will be noted that the inner of these two connecting points does not lie on the same center line as the end connections of lever *F*. At *G* on the lower end of arm *F*, is a stud for connecting it to the slide arrangement. In use, the pedal is depressed, causing *G* to move in a relatively straight line toward the left, the motion being controlled by the two links *D* and *E*, which move in the paths indicated by the dot-and-dash lines. Two of these mechanisms are employed, one being mounted at each end of the slide which passes between them. B. M.

* * *

It is a part of General Motors operating philosophy that what is good for the country is good for General Motors and what is not good for the country is not good for General Motors.

Hard-Facing Procedure

In a recent number of *Oxy-Acetylene Tips*, published by The Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y., the technique for hard-facing with Haynes Stellite alloy rod is outlined and the following important points listed:

1. Thoroughly clean the surface before trying to hard-face it.
2. Machine any edge or corner to be hard-faced if it is likely to be subjected to shock.
3. Preheat to a faint red heat, visible in a darkened room only, without goggles.
4. Always use an excess-acetylene flame.
5. Do not apply the hard-facing alloy before the surface of the base metal reaches the "sweating" temperature.
6. Hold the rod and blowpipe tip each at an angle of about 45 degrees to the work.
7. Let the end of the inner cone almost touch the rod.
8. Do not stir the molten puddle with the rod.
9. Never cover over or embed any foreign particles in the deposit. Float and remove them or they may cause blow-holes.
10. Complete the operation in one pass, if possible. Do not deposit successive layers of alloy unless absolutely necessary.
11. Remove the flame from the puddle slowly, with a circular motion.
12. Cover the finished job with asbestos paper or bury it in powdered mica, lime, or ashes, so that it will cool slowly.

* * *

Lubricant for Inspection Gages

CMD Center Point lubricant, manufactured by the Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago, Ill., is said to be used successfully to reduce gage wear and shorten inspection time. This lubricant prevents sticking when gaging with plug, ring, snap, or thread gages. It can also be used as a rust preventive over the entire gage as a protection against corrosion caused by perspiration.

* * *

New "De-Ion" Circuit-Breaker

A new "De-Ion" circuit-breaker which requires less space and permits lighter structures for distribution panel boards, built-in applications, and bus duct plug-ins, has been developed and placed on the market by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The new circuit-breaker, of 100 amperes capacity, requires only the space occupied formerly by a 50-ampere circuit-breaker.

Broach-Holder and Expanding Collets of New Design

THE broach-holder shown in Fig. 1 and the design for internal expanding collets illustrated in Fig. 2 are interesting new developments in the line of equipment brought out by Zagar Tool, Inc., Cleveland, Ohio. The broach-holder was developed to provide means for increasing the speed of broaching operations and also to simplify the manufacture of stronger pull type broaches.

Instead of the conventional key-slot used for attaching the broach, the shank end of the broach used with these new holders can be threaded as shown at *D*, Fig. 1, or machined as indicated at *E* and *F*. The threaded design is recommended, using fine-pitch threads. The threads can be cut while the broach is in the soft state or they can be formed by grinding after the broach has been hardened. The strongest construction is obtained by grinding the threads in the broach shank after it is hardened.

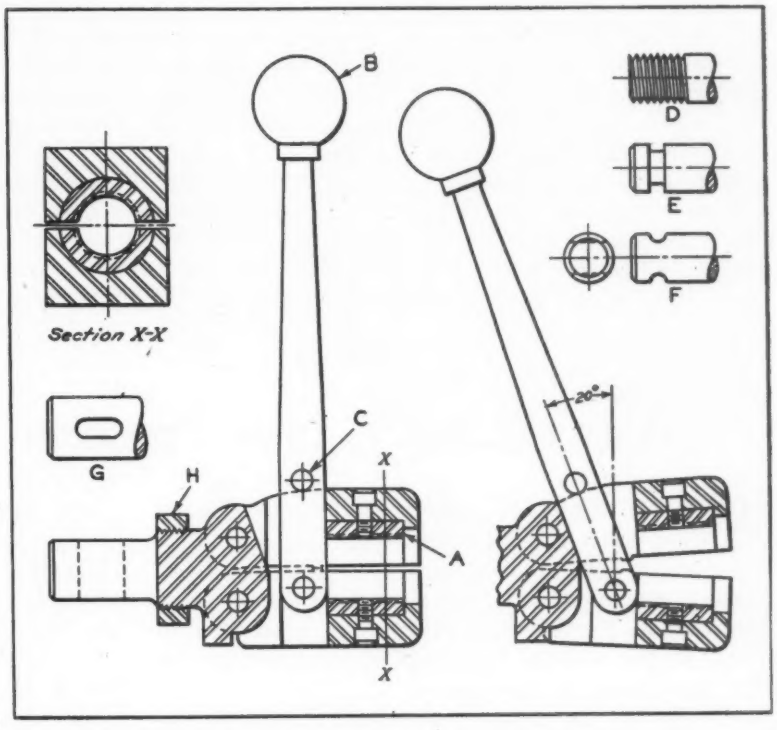


Fig. 1. Quick-acting Broach-holder with Interchangeable Pads A for Holding Different Types of Broach Shanks

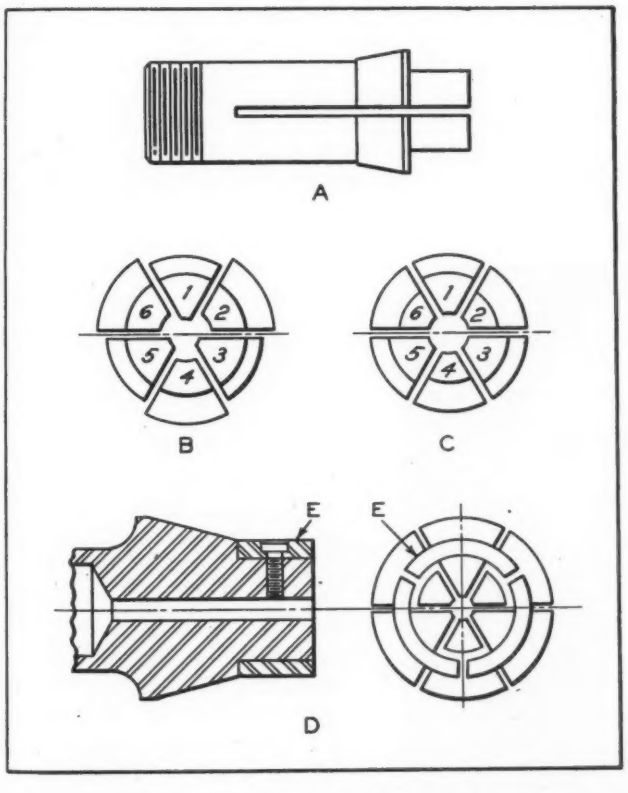


Fig. 2. Internal Expanding Collet Designs for Use on Screw Machines and Lathes

The threaded pads *A* which grip the broach are removable and are furnished in any standard pitch thread from 3/16 to 1 inch in diameter. The holder is self-centering, and is made of tough alloy steel, hardened and ground. The shank *G* can be made to fit any make of broaching machine. Pads for holding broaches having grooved or slotted shanks, as indicated at *E* and *F*, can be readily substituted for the threaded pads *A*. Broaches that are broken at the holding groove or slot can be salvaged by thread-grinding the remaining end and using threaded pads *A* or by applying a threaded extension.

In operating the holder, handle *B* is moved to the left through an angle of 20 degrees, causing the jaws to spring open, as indicated in the view to the right. After the broach has been inserted, handle *B* is rotated clockwise through an angle of 20 degrees, causing pin *C* to close and lock the jaws *A* securely around the broach.

The internal expanding collets designed to operate on the principle illustrated in Fig. 2 are being made for use on any make of screw machine, lathe, or other machine tool employing collets without requiring additions or alter-

ations to the existing equipment. They are simply inserted in the spindle, the same as conventional collets, and are opened in the same manner, either by drawing in or pushing out on the collet operating rod.

The collet is similar to the standard 5-C draw type shown at *A*, Fig. 2, which has an extended portion for holding the part internally. The collet is split into six parts or segments, as shown at *B*, the opposite segments 1 and 4, 2 and 5, and 3 and 6 being fastened together. With this arrangement, the action of the collet body on the tapered section causes section 2, for instance, to push section 5 outward, away from the collet center, while section 2 is being forced inward. In the same manner, section 4 pushes section 1 outward, while section 6 pushes section 3 outward. Thus, jaws 1, 3, and 5 are expanded to grip the work internally.

Because the type of holder shown at *B* grips the work by means of the three widely spaced segment jaws, it is not recommended for thin-walled part. For thin-walled parts 1 inch or larger in diameter, internal master collets can be supplied which have pads *E* that contact the hole or bore in the work around practically its entire surface. These internal expanding collets can be furnished to hold internally threaded parts, eliminating the necessity for turning or screwing the parts on and off the arbors.

Alex D. Bailey, New President of the A. S. M. E.

ALEX D. BAILEY, vice-president in charge of operations and engineering of the Commonwealth Edison Co., Chicago, Ill., has been elected president of the American Society of Mechanical Engineers for 1945. He will assume office at the annual meeting, to be held during the last week in November.

Mr. Bailey was born in Kenosha County, Wis., in 1882, acquired his grammar and high school education in Chicago and in Glen Ellyn, Ill., and received the degree of mechanical engineer in 1903 at the Lewis Institute. The honorary degree of doctor of science was accorded him at the dedication of the Technological Institute of the Northwestern University in 1942.

He entered the employ of the Commonwealth Edison Co. in 1903, and progressed successively through the positions of chief engineer of the Fisk and Quarry Stations, superintendent of generating stations, chief operating engineer, assistant to the vice-president, and vice-president.

Throughout this period of participation in the management of large steam station generating equipment, he has contributed to many improvements in the design and operation of special equipment and to advances in operating practices. He has been a member and chairman of many operating and research committees in the Association of Edison Illuminating Companies, the National Electric Light Association and the Edison Electric Institute.

Mr. Bailey has long been interested in engineering education, and frequently addresses engineering students on the broader aspects of education with a view to making the engineering student a better and more useful citizen. For nearly four years he was chairman of the Board of Trustees of the Lewis Institute, and since the merger of that institute with the Armour Institute in 1940 he has been vice-chairman of the Board of Trustees of the Illinois Institute of Technology.

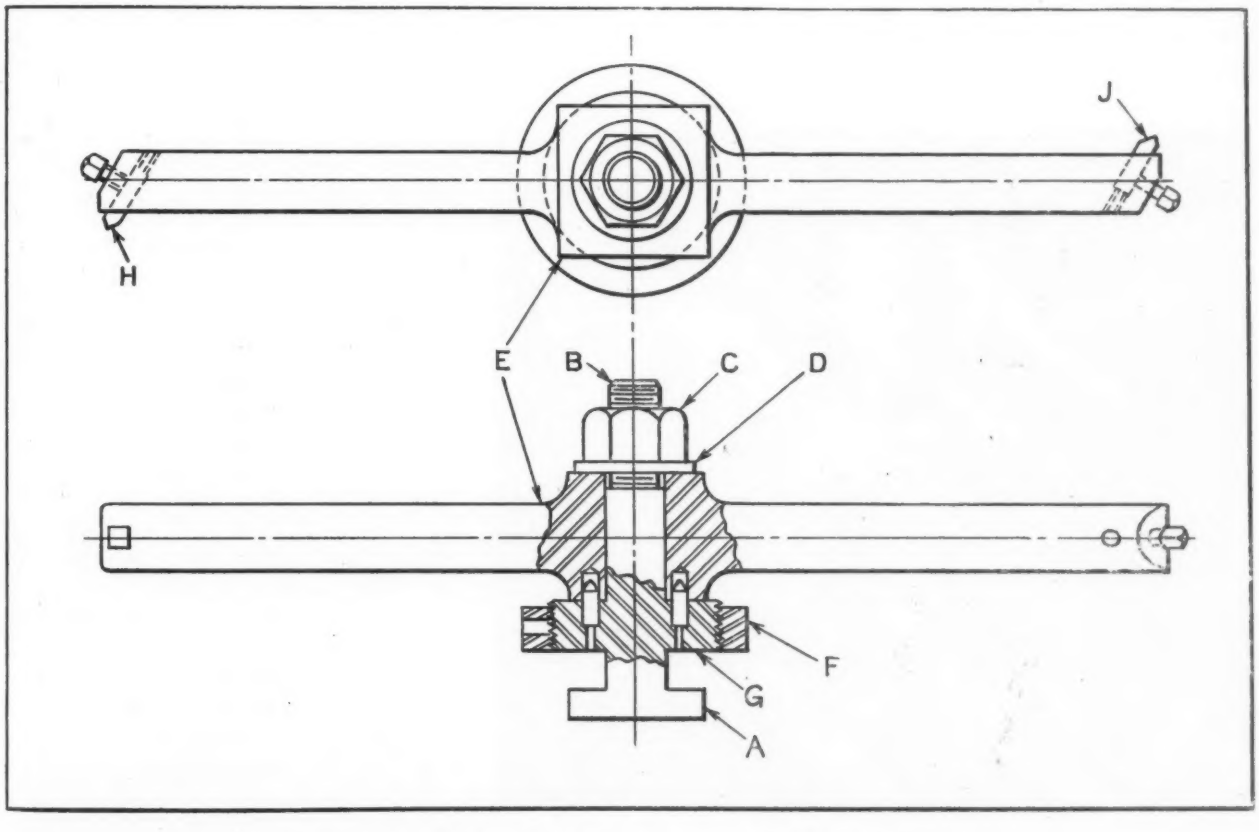
He became a junior member of the American Society of Mechanical Engineers in 1910. In 1917 he became vice-chairman of the Chicago Section, and the following year chairman. He has also been vice-chairman and chairman of the Power Division of the Society; delegate to the International Fuel Conference in London, 1928; chairman of the Standing Committee on Research; and a member of the Society's council, first serving as manager from 1933 to 1935, and then as vice-president from 1936 to 1937. He has been chairman of the Advisory Board on Standards and Codes, and is now active on a number of standing committees concerned with research and education and training. Mr. Bailey is also a member of the Western Society of Engineers and the Society for the Promotion of Engineering Education. In addition, he has always taken an active part in the affairs of the communities in which he lived.

Boring-Bar Designed for Roughing and Finishing Cuts

By B. J. STERN, New York City

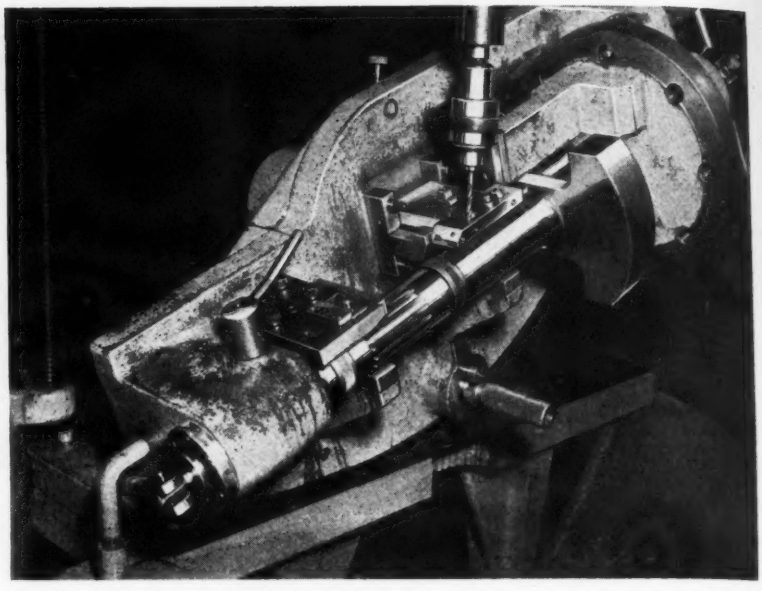
A boring-bar that can be used for both rough- and finish-boring at one setting is shown in the accompanying illustration. Although designed for use in a small Pratt & Whitney lathe, it can be easily adapted to any medium-sized lathe. The foot *A* of the pivot stud *B* is shaped to fit the slot of the compound rest. By turning the nut *F* down, the stud *B* can be clamped securely to the compound rest, thus giving the boring-bar the required rigidity.

The boring-bar *E* can be turned about the pivot stud *B* and clamped in place by nut *C* and washer *D*. At one end of the bar is a boring cutter *H*, which is set for taking a roughing cut. After the roughing cut is finished, the boring-



Boring-bar Equipped with Roughing and Finishing Cutters

bar is brought back, the nut *C* loosened, and the bar lifted and swung around so that the finishing cutter *J* can be presented to the work. Accurate turning or indexing of the bar through an angle of 180 degrees is insured by means of the pins *G* driven into the pivot stud *B*. These pins are machined to an accurate fit in the indexing holes in the boring bar *E*.



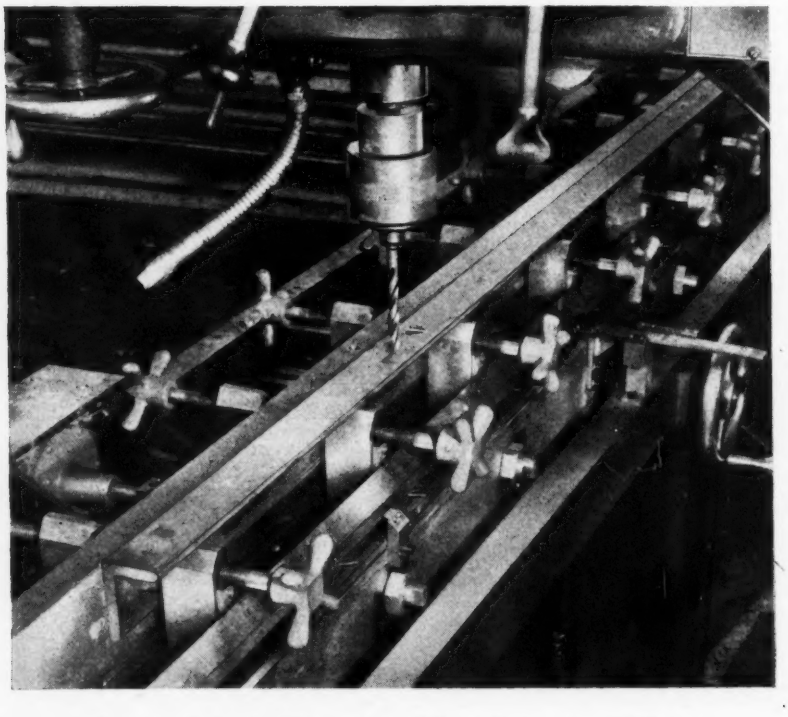
Special Box Type Drill Jig Developed for Drilling All Small Holes in Crankshafts for Radial Air-cooled Engines

Special Drill Jig for Radial Engine Crankshaft

The Lycoming Division of the Aviation Corporation, Williamsport, Pa., recently developed the special drill jig here illustrated, which makes possible the drilling and reaming, in one operation, of all small holes in the crankshafts for its R-680 radial air-cooled engines. This jig takes the place of five separate jigs formerly required for this work, reducing the set-up time by 80 per cent. The loss of critical material resulting from nicks and scratches on the crankshaft surfaces caused by handling the parts several times has also decreased proportionately.

The jig is of the box type and is mounted on trunnions for setting up on a drill press table. Once located in this jig, the crankshaft can be rotated or tilted to any position for drilling the oil-holes, oil-tube holes, and propeller nut dowel-pin holes. Movement of the jig is controlled by means of index-plates on the back and front of the fixture.

The quality of the work has been improved by the use of this new jig, which holds all dowel-pin and oil-tube holes to size within a tolerance of 0.0005 inch on the diameter. The oil-holes are also held to close tolerances on length, and must match mating parts. With this jig, one operator is responsible for the entire sequence of drilling operations.



Structural Angle Clamped to T-bar, Ready for Drilling

Fixture for Drilling Accurately Spaced Holes

A new fixture for drilling holes in structural angles up to 10 feet in length has been devised by R. K. Best at General Electric's Pittsfield Works. The fixture consists of a T-bar holding assembly equipped with scales and indicators for quick, easy, and accurate horizontal indexing in either direction. It rides on rollers located in a channel, the side of which acts as a guide. The fixture can be easily moved in a lengthwise direction by the operator, and can be traversed in a crosswise direction by means of a pair of worms operated by a handwheel at the front of the fixture base.

The piece to be drilled is held in place by hand-operated clamps. These clamps are provided on both

sides of the T-bar, thus allowing both sides of the angles to be drilled without turning them end for end. The hand clamps could easily be converted to air-operated clamps, thereby reducing the time required for clamping the piece to the T-bar. Air clamps are provided to locate the entire assembly in position.

Both longitudinal and lateral scales are directly in front of the operator. A chart furnished with each set of angles to be drilled corresponds to the scales and shows the center positions of the holes to be drilled.

Rapid Indexing Fixture

The fixture here illustrated is applied to a horizontal milling machine. It was designed for rapidly milling the oil-slots in tubes. A number of indexing positions were required, making it necessary to use index-plates. The plates, which are connected to the chuck holding one end of the tube, can be easily changed for different tubes. The opposite end of the tube is supported by a tailstock fitted to the machine table.

The body *A* of the fixture is a U-shaped casting, the inside faces of which are machined to receive an operating nut *B*. A collet *C* is threaded to fit this nut and is prevented from turning by a key which projects into a groove milled in the collet; hence the collet has a lateral motion when nut *B* is turned.

The bushing *D*, fitted in the cast-iron body *A*, has a taper bore corresponding to the tapered jaws of the collet and thus serves to close the jaws. This bushing also acts as a bearing for the end of spindle *E* on which chuck *F* is mounted.

The hardened steel ring *G* is keyed to the spindle *E* and is serrated to engage similar serrations in the left-hand face of nut *B*. The plug *H*, which carries the index-plate *J* and the pin *K*, is keyed to spindle *E*. The pin acts both as locator and driver. The slotted nut *L* fastens the plate against the plug. A bushing fitted to the body acts as a bearing for plug *H*. The outer end of the spindle is threaded to receive two slotted nuts L_1 which are tightened just enough to prevent endwise motion, but permit the spindle to revolve. A cover plate protects the mechanism from dirt and chips.

For accurate indexing, bushings are forced into the plate *J*. These bushings have tapered bores to receive the tapered end of the hardened and ground steel plunger *M*, which is slotted to permit it to enter the forked lever *N*. This lever is hinged to the body by a pin. The plunger is also drilled and reamed to receive the shoulder pin *P*, which is held in engagement by a spring-loaded plug. A helical compression spring *Q* helps keep plunger *M* in position.

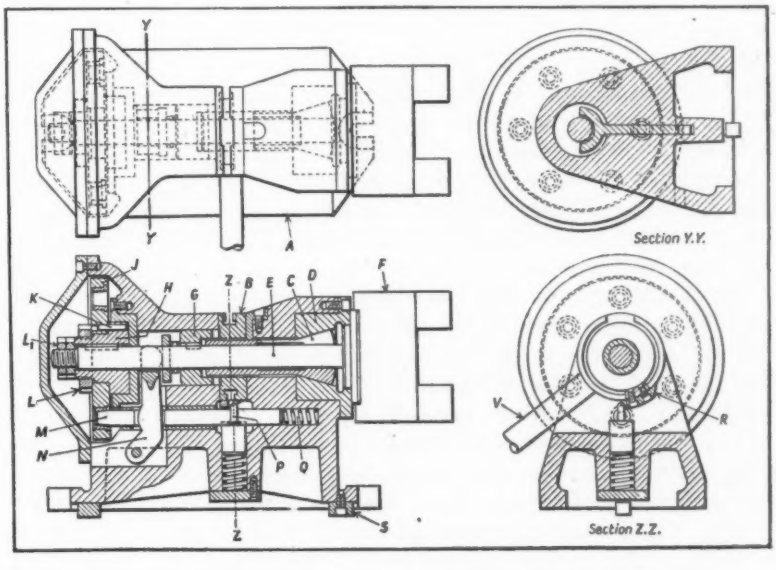
A cam-plate *R* is secured to the operating nut by T-nuts and screws, the T-slots machined in the circumference of the operating nut allowing adjustment for the cam-plate. An opening is milled in the operating nut to allow the T-nuts to enter the T-slot. Keys *S* locate the fixture on the machine table, to which it is held by T-bolts.

As nut *B* is turned by lever *V*, plate *R* in contact with pin *P* removes plunger *M* from its seat. As the plunger is withdrawn, it swings the forked lever inward, bringing the serrated faces of ring *G* and nut *B* together. This contact takes place before the plunger is clear of the bushing in plate *J*, the resultant slip being provided for by a weak spring and thrust plate.

A slight dwell on cam *R* allows the plate *J* to be turned just sufficiently for the plunger to clear its previous bushing. This occurs as pin *P* reaches the end of the cam, thereby releasing the plunger which is held against the swivel plate by spring *Q*. After further rotation of the lever, the plunger slips into the next bushing. As the lever is reversed for locking, the bevel edge of the cam depresses pin *P*, which is returned by its controlling spring on clearing the cam.

S. S.

A new bulletin known as "Non-Ferrous Forgings Digest," will be published periodically by the Brass Forging Association, 420 Lexington Ave., New York City. Copies will be distributed to companies interested in non-ferrous forgings.



Fixture for Rapid Indexing when Milling Slots in Tubes

Tool Engineers Hold Successful Meeting in Syracuse

THE twelfth semi-annual meeting of the American Society of Tool Engineers, held in Syracuse, N. Y., October 12 to 14, was exceptionally well attended as usual, the registration reaching a total of over 600. The technical program was covered in five sessions devoted to the following subjects: Production control and costs; magnesium; operating a branch plant; tooling instrument work for factory production; and tool engineering education.

D. D. Burnside, President American Society of Tool Engineers

The session on production control gave a thorough demonstration of how the International Business Machines Corporation exercises control of production and costs. W. E. Crotsley, director of manufacturing control education of the corporation, had chosen as the subject of his paper "Effective Production and Manufacturing Control." In this paper, he gave a detailed outline of the procedure followed. S. E. Lenox, assistant superintendent of the Tool Division of the organization, gave equally specific information in his paper "Tool Control and Follow-Up."

Another unusually instructive session was that on magnesium. On this subject three papers were presented. Otis E. Grant, eastern manager of the Magnesium Division of the Dow Chemical Co., introduced the subject in his paper "Magnesium Production and Fabrication," in which he reviewed the phenomenal growth of the industry and described methods of producing the metal and the finishing processes used, as well as methods of joining and assembling magnesium products.

Then followed a detailed review of "Fabrication Methods for Assemblies of Magnesium Sheets and Stampings," presented by E. Howard Perkins, of Brooks & Perkins. This paper dealt with the hot-forming process applied to magnesium sheets, and welding and riveting practice, as well as special methods necessary for economical production from magnesium.

The third paper in this group, entitled "Machining Magnesium," presented by Carl J. Wiberg, supervisor of the Special Process Division of the Production Engineering Department of the Wright Aeronautical Corporation, gave specific instruction on magnesium foundry practice, and on drilling, reaming, milling, turning, boring, tapping, grinding, lapping, burring, and polishing of magnesium parts. Attention was given to fire hazards involved in machining magnesium, with seven definite directions for avoiding and controlling any dangers from this source. Coolants for machining and corrosion prevention were also dealt with. Some points on fixtures for magnesium parts, and directions for gaging were included.

An unusual series of papers was offered at the session on "Operating a Branch Plant in Canada." This series dealt with the production phase, the personnel phase, and the management phase, covered, respectively, by W. A. Dawson, chief inspector, Otis-Fensom Elevator Co.; E. N. Wearn, superintendent, Canadian Acme Screw and Gear Co.; and Edward Kennard, vice-president and general manager, St. Catharines Steel Products, Ltd. These papers offered an opportunity to compare production procedures of Canadian plants with those of American organizations.

In this series, Mr. Dawson dealt with many production items more or less peculiar to Canadian manufacture and markets, such as the use of British machine tools, effect of British standards on Canadian markets, and the post-war disposal of surplus machine tools. Mr. Wearn discussed labor rates, tool bonus systems, unions, and similar personnel problems, while Mr. Kennard covered, among other subjects, the higher capitalization necessary because of increased costs in Canada; he emphasized that the lower wage rates were offset by less production and smaller markets.

The session on "Tooling Instrument Work for Factory Production" introduced a highly specialized subject, covered in four papers on the construction and manufacture of panoramic sights at the Camera Works of the Eastman Kodak Co. Francis M. Shull, optical engineer

of the company, described the panoramic sight, dealing with its construction and its use in the field. The machining, assembling, and testing methods used in optical instrument manufacture were outlined by Paul G. Yingling, process engineer of the organization, while William R. Gordon, chief tool engineer, dealt with the subject "Interesting and Unusual Tools Used in the Manufacture of the Panoramic Sight." The last phase of the subject, "Training Supervision and Unskilled Workers for Instrument Assembly," was presented by Howard C. Wellman, training supervisor of the Eastman Kodak Co.

The final professional session of the meeting, devoted to tool engineering education, brought out many new viewpoints and ranked as one of the most constructive contributions to technical education ever offered by an industrial association. It was presided over by Otto W. Winter, chairman of the Society's Education and Training Committee. Mr. Winter's comments added much to the clarification of the Society's definite aims in the direction of specific education for tool engineering. Each of the speakers covered his subject in a thorough, detailed manner. Dr. Mark Ellingson, president of the Rochester Institute of Technology spoke on "Education for Reality," emphasizing an important idea so often overlooked by professional educators. William F. Patterson, director of Apprentice Training Service of the Man-Power Commission, spoke on "Only Apprenticeship Builds Craftsmen" and L. J. Fletcher, director of training of the Caterpillar Tractor Co., spoke on "Training Tomorrow's Tool Engineer."

The principal address at the semi-annual dinner of the Society was made by James Y. Scott, president of the Van Norman Co., and president of the National Machine Tool Builders' Association. Mr. Scott's subject was "Engineering for Peace," but his inspiring remarks covered an even broader field.

A Machine and Tool Progress Exposition, to be held under the auspices of the American Society of Tool Engineers in Cleveland, Ohio, March 19 to 22, 1945, was announced at the meeting. It was also announced that the *Tool Engineer*, the official magazine of the Society, will be published by the Society's own organization beginning with the February, 1945, number. For the last ten years, the *Tool Engineer* has been published through an independent publisher. The membership of the Society now numbers over 16,000.

* * *

Employes of the Westinghouse Electric & Mfg. Co. saved the war effort $835,100 in labor and material costs of armament production during the first six months of 1944 by suggesting new and better ways of getting things done.

Government in Business Leads to Corrupt Politics

A well-known Washington authority says, "When Government fixes wages, then the Government can play politics with wages." Not only is this true, but it is equally true that when Government fixes prices of farm products, then it can play politics with the prices of farm products. Whenever the Government steps in to do things that are normally regulated by supply and demand, it opens the way for political bargaining; and whenever Government steps in to do things that should be left to the judgment and decision of the individual and of individual enterprise, then, again, the gates are thrown wide open to the politician to use such interference to his own ends. Furthermore, the step from playing politics to corrupt politics is a very easy one.

* * *

Electric-Limit Switch Reduces Cutter Breakage

An electric-limit switch, used in conjunction with a shear pin, has considerably reduced cutter breakage on a special plunge milling operation at General Electric's Erie Works. A regular shear key was first tried in the machine; but since the automatic cycle might not be completed, the feed would not stop with the cutter.

An electric-limit switch and plunger was installed and the steel key was replaced with a softer brass one, the length and strength of which were determined by experimentation, so that the key would fail before the cutter. When the key shears, the projecting end—which rides against a disk connected to the limit switch—falls free, releasing the switch and causing the machine to stop.

* * *

Preventing Metals to be Heat-Treated from Tarnishing

One of the simplest methods of preventing metals that are to be heat-treated from tarnishing is the use of welding flux. Autochemic Eutector flux, made by the Eutectic Welding Alloys Co., 40 Worth St., New York 13, N. Y., is claimed to be particularly effective in this respect. When used for preventing metals to be heat-treated from tarnishing, the flux is slightly diluted with water and poured into a tank large enough for immersion of the part to be coated. The mixture is agitated to keep the heavier elements in the flux from settling. The part can also be coated with the flux by immersing it in flux that has been melted in a crucible.

Materials of Industry

THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

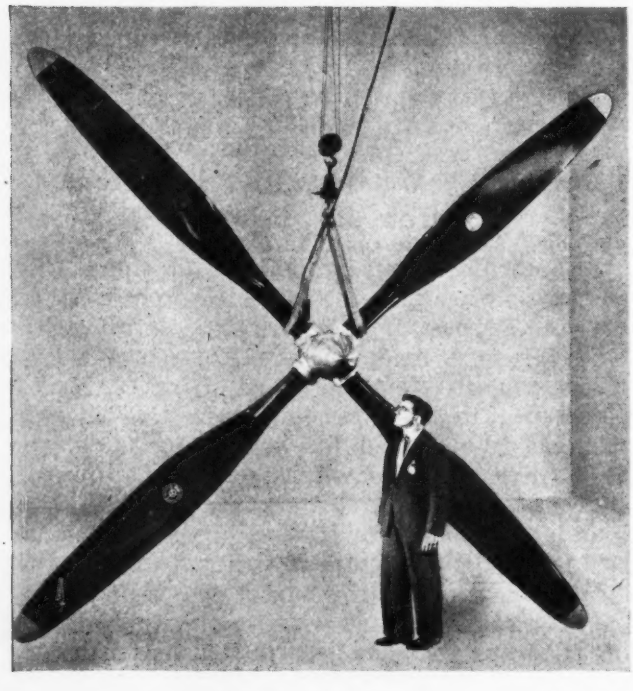
Walesite Board for Punch-Press Plate Sets and Templets

A strong, light-weight, laminated lignin plastic board called Walesite is being manufactured by the Wales-Strippit Corporation, North Tonawanda, N. Y., for press applications. Walesite is a uniformly dense material which is resistant to water, oil, grease, and dilute acids. It can be sawed, turned, drilled, tapped, threaded, and milled with metal-working tools. It is made to close tolerances as regards flatness, and has proved entirely satisfactory for making plate sets and for mounting of hole punching and notching units in presses. 201

Reclamation Process Developed for Synthetic Rubber

Heretofore considered totally "expendable" because every known method of reclamation used upon it had failed, synthetic rubber is now being salvaged for re-use in manufacture, according to the United States Rubber Co., Rockefeller Center, New York City. Millions of pounds of used tires, tubes, treads, motor supports, shoe scrap, and mill overflow can now be salvaged.

Formulas applied to natural rubber for reclaiming purposes failed to make the synthetic material plastic enough to start reclaiming processes. New formulas were compounded and test after test conducted until processes were developed that have now made possible the reclaiming of this scrap material. Thus far, more than 1,000,000 pounds have been reclaimed by employing the same machinery that has for years been used for natural rubber reclamation. The reclaimed synthetic rubber is used in the manufacture of the same products for which it was originally employed. 202



A Curtiss aircraft propeller, over 18 feet in diameter—largest propeller ever to fly in the United States—is composed of four hollow steel blades, and is said to effect a saving in weight of 20 per cent over a propeller of comparable diameter with solid aluminum-alloy blades

Fast-Drying Rust Inhibitor for Protecting Metal Parts

A new rust-preventive coating for protecting metal parts and equipment during storage, shipment, and in some cases during service, has been developed by the Witco Chemical Co., 295 Madison Ave., New York 17, N. Y. This compound, known as Witco No. 673 rust inhibitor, can be applied either by dipping or spraying to produce a rapid drying coating that is non-abrasive, non-corrosive, and easily removed with ordinary solvents. It has a melting point in excess of 250 degrees F. and remains flexible at temperatures down to 20 degrees below zero...203

Lucite Gear-Case Covers Protect Quartz Crystals while Cutting

Gear-case covers made of "Lucite" methyl methacrylate resin (a product of E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.)

To obtain additional information on materials described on this page, see lower part of page 188.

now protect quartz crystals and mechanisms during the precision cutting operations necessary to fit the crystals for use in electronic devices. In this new application, "Lucite" permits continuous readings of vernier calibrations during cutting, which must be done to extreme degrees of accuracy. The convex, transparent plastic cover prevents the destructive coolant and the quartz abrasive from damaging the delicate operating parts of the cutter. "Lucite" was selected for the purpose because of its superior optical qualities, freedom from distortion, and ability to meet tolerances within ten-thousandths inch. 204

Buna N Oil-Resistant Synthetic Rubber for Oil Seals and Rings

A new Buna N fuel-resistant material, known as 233-5, which retains a tensile strength of over 1000 pounds per square inch and an elongation of over 100 per cent after being subjected to aircraft engine oil at 300 degrees F. for a period of seventy hours, has been developed by Los Angeles Standard Rubber, Inc., 1500 E. Gage Ave., Los Angeles, Calif. This Buna N material was designed for oil seals, oil rings, and other applications requiring resistance to aromatic fuels. It also remains flexible at 40 degrees F. below zero. 205

Silicone Resins for High-Temperature Electrical Insulation

Siiicones, a new class of organo-silicon insulating materials, are now in commercial production by the Dow Corning Corporation of Midland, Mich. These new products have exceptional heat stability, resistance to moisture, and freedom from carbonization at high operating temperatures. They are, therefore, natural complements to inorganic spacing insulation, such as Fiberglas, asbestos, and mica, used in electrical equipment.

Several types of Dow Corning insulating resins have been under development, each designed for a specific use. One of these—Dow Corning 993—is employed as an impregnant and coating for Fiberglas served magnet wire and for woven Fiberglas electrical tapes, cloth, and sleeving. Another type—Dow Corning 2052—is intended as an impregnant and thermosetting dielectric for rotating parts of electrical equipment. Because these insulating resins make possible higher safe operating temperatures, they permit the design of electrical equipment of increased power output, decreased size and weight, and improved reliability. 206

Two New Plastics Developed by Westinghouse

A tough new moisture-proof plastic called Fosterite, used to seal radar and radio parts against moisture, has been developed by the Westinghouse Research Laboratories. This plastic is particularly suitable as an impregnant because, being almost as fluid as water, it fills completely every minute space in electrical coils and windings, and after setting, leaves no air gaps through which moisture can seep. Fosterite, unlike varnish, requires no liquid solvent, which would evaporate during the drying process, leaving tiny cracks for moisture to enter. It fuses into an impenetrable solid when heated.

Also developed at the Westinghouse Laboratories is a new synthetic resin which is replacing shellac in many important applications. This product has the advantage of being free from the impurities normally present in the natural product. A one-inch square bar of this synthetic resin is said to be strong enough to support a 40-ton locomotive suspended from it. 207

Rod stock in sizes up to 2 inches in diameter is now being extruded by the Detroit Macoid Corporation, Detroit, Mich., from Tenite plastic made by the Tennessee Eastman Corporation, Kingsport, Tenn. These rods are applicable to a variety of uses—tool handles, gage handles, hammer heads for use on materials that would be dented under the blow of a steel hammer, etc. Extruded rod is also used by model-makers to construct parts that are later molded from plastics

To obtain additional information on materials described on this page, see lower part of page 188.

Turret Lathe Operation on Supercharger Impeller Shafts

Supercharger impeller shafts for aircraft engines are turned in several turret lathe operations in the plants of the Allison Division of General Motors, Indianapolis, Ind. The illustration shows one of these operations, performed on a turret lathe built by the Midland Machine Corporation, in which the integral gear is turned, faced on one side, and under-cut to form a web of narrower width than the gear face. The short shank which extends from one side of the gear is also turned straight to a shoulder and taper-turned in back of the shoulder the remaining length to the gear face. This taper is cut by the tool seen in action, which is mounted on a slide at the back of the cross-slide. The tool-slide is set at the required angle of taper with respect to the axis of the work. When the tool-slide is pushed by a roller mounted on one of the turret faces, the work is turned to the required taper.

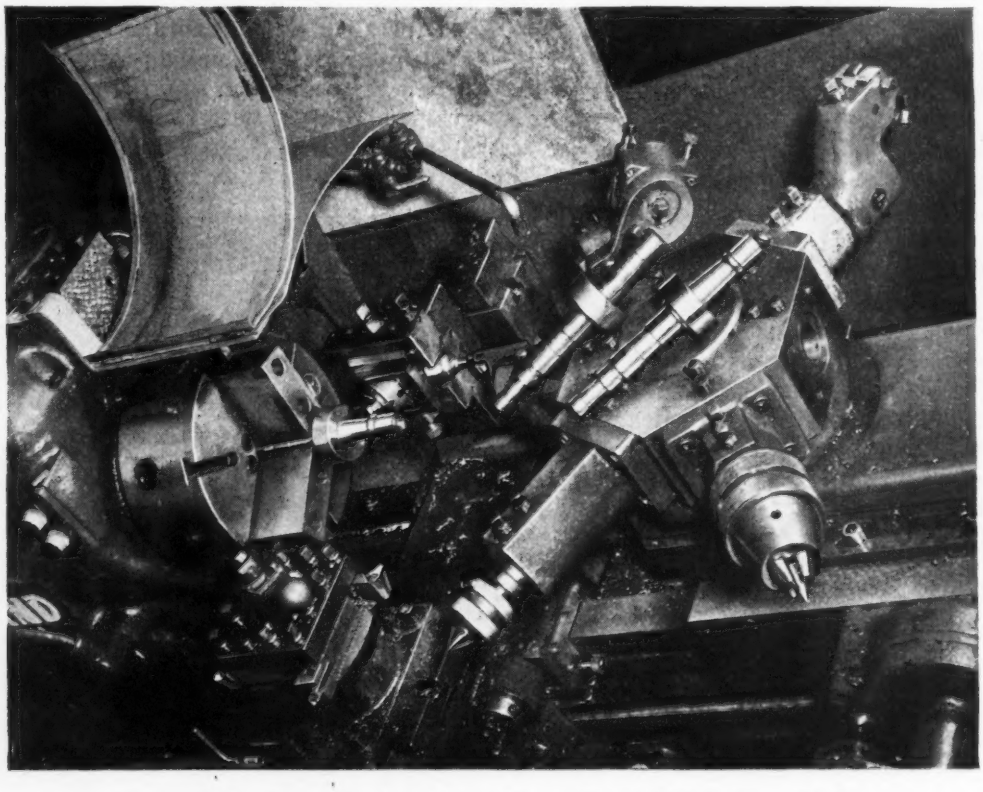
All the cutters used in this operation are tipped with tantalum carbide except the centering tool seen on the turret. The part is centered so as to permit holding the overhanging end on a center mounted on the hexagonal turret while cuts are being taken by tools mounted on the square turret at the front of the cross-slide.

Method of Tipping Tools to Shanks

According to the Eutectic Welding Alloys Co., 40 Worth St., New York 13, N. Y., the company has developed alloys to be used in connection with a new method for tipping tools to shanks. The new alloys are known as EutecRod 1800, having a melting point of from 940 to 1140 degrees F. and intended for high-speed steel tips; EutecRod 1601, having a melting point of 1020 to 1250 degrees F. and high tensile strength, intended for tungsten-carbide tips; and EutecRod 16, with a melting point of 1300 to 1750 degrees F., also intended for tungsten-carbide tips, this alloy being heat-resistant and of high tensile strength.

After the customary degreasing and grinding, the powdered alloy is spread on the surfaces to be joined and the tip is placed on top. The assembly is then heated until the alloy powder melts. The metal flows freely at a very slight increase in temperature above the melting point. Oxidation of the tip material is prevented, owing to the fact that each particle of molten alloy immediately "tins" and adheres to the surfaces being joined.

This new method of tipping tools has been tried out in actual practice, and is now in use by many tool manufacturers and other plants.



Turret Lathe Operation in which a Taper Cut is Taken by a Tool at the Rear of the Cross-slide which is Fed at an Angle by a Roller on the Hexagonal Turret

New Trade Literature

RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

To Obtain Copies, Fill in on Form at Bottom of Page 187 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the November Number of MACHINERY

Tap Handbook

SOSSNER TAP & TOOL CORPORATION, 161 Grand St., New York 13, N. Y. Handbook on ground thread taps, covering tap terms; tap selection; standard taps; special taps and threading tools; thread limits; tap dimensions; and appendix of engineering data—conveniently arranged for ready reference. Copies available without charge to those making request on company stationery, stating name and position occupied. 1

Grinding Facts

CARBORUNDUM CO., Niagara Falls, N. Y. 136-page reference book on grinding, containing a complete explanation of the new standard marking symbols for grinding wheels; grading recommendations for general, tool-room, diamond-wheel and thread grinding; a description of all common types of grinding; safety rules; and a table of speeds. 2

Machine and Tool Contract Services

SHEFFIELD CORPORATION, Dayton 1, Ohio. Booklet CS-144, outlining the company's contract services, including the design and manufacture of tools, dies, jigs, and fixtures, special-purpose machine tools, threaded and formed parts, assemblies, etc. 3

Surface Roughness Measuring Instruments

PHYSICISTS RESEARCH CO., 343 S. Main St., Ann Arbor, Mich. Technical supplement to "Profilometer Comments,"—discussing the technical aspects of the Profilometer as an electronic measuring instrument for determining the surface roughness of parts. 4

Precision Production

ACE MFG. CORPORATION, Erie Ave. at "K" St., Philadelphia, Pa. Catalogue entitled "Fine Precision Geared to Faster Production," describing the facilities of this concern for turning out small parts and assemblies requiring stamping, machining, heat-treating, and grinding. 5

Multiple Automatic Tapping Machines

D. H. PRUTTON MACHINERY & TOOL CO., 5295 W. 130th St., Cleveland 11, Ohio. Circular descriptive of the Prutton "Tapmaster," a three-spindle automatic tapping machine suitable for tapping three sizes of holes simultaneously. 6

Time-Measuring Instruments

NATIONAL INSTRUMENT CO., 246 Walnut St., Newtonville 60, Mass. Circular 844, descriptive of the "Quick Reset Timeter," an electrically operated measuring instrument that automatically registers total operating hours of any electrical device or motor-driven machine..7

Laying-Out Device

PETERSON PRECISION INSTRUMENT CO., 10144 S. State St., Chicago 28, Ill. Circular on the "Arcometer," an instrument for laying out bolt holes on flanges, spacing ribs, or spacing blades in impellers, etc., of use in the machine shop, tool-room, and pattern shop. 8

V-Belt Drives

MULTIPLE V-BELT DRIVE ASSOCIATION, 140 S. Dearborn St., Chicago 3, Ill. Booklet entitled, "From the Shadoof to the Dominant Drive," containing a brief outline of the history of power transmission and the development of the V-belt drive 9

Electronic Induction Heat-Treating Service

CENTRAL BOILER & MFG. CO., 5818 Rivard St., Detroit 11, Mich. Folder entitled "Here's Help on Your Heat-Treating Problem," outlining the electronic induction heat-treating service offered by the company for job shops. 10

Self-Lubricating Bearings

CHRYSLER CORPORATION, Amplex Division, 6501 Harper Ave., Detroit 31, Mich. Catalogue B-44 containing 168 pages, 8 1/2 by 11 inches, of complete engineering data covering Oilite powdered-metal self-lubricating bearings..11

Hydraulic Cylinders

JOHN S. BARNES CORPORATION, 301 S. Water St., Rockford, Ill. Bulletin 401C, descriptive of the Barnes line of hydraulic cylinders for use in connection with machine tool and for other applications requiring unusual flexibility. 12

Correct Drill Pointing

CHICAGO-LATROBE TWIST DRILL WORKS, 411 W. Ontario St., Chicago 10, Ill. Booklet entitled "Correct Drill Pointing," containing instructions on the correct procedure to follow in pointing twist drills for use on all types of materials.....13

Precision Lofting

TEMPLATE REPRODUCTION CO., 401 N. Broad St., Philadelphia 8,

Pa. Booklet entitled "Precision Lofting," describing the new industrial "lofting" method for producing with accurate templets a variety of products. 14

Pantograph Engraving Machines

GEORGE GORTON MACHINE CO., 1310 Racine St., Racine, Wis. Booklet 1580-B, covering specifications and applications of standard Gorton model pantograph engraving machines and attachments. 15

Alternating-Current Arc Welders

GENERAL ELECTRIC CO., Schenectady 5, N. Y. Bulletin GEA-4081, telling how GE alternating-current arc welders help increase production, improve weld quality, and reduce costs. 16

Servicing Multiple-Disk Clutches

ROCKFORD DRILLING MACHINE DIVISION, BORG-WARNER CORPORATION, Rockford, Ill. Booklet containing instructions for installing and servicing Pullmore multiple-disk clutches. 17

Multiple Punching Units

WALES - STRIPPIT CORPORATION, 345 Payne Ave., North Tonawanda, N. Y. Catalogue H, illustrating and describing the new Wales Type H hole punching units for punching holes in curved and straight flanges and rims. 18

Tool Steel Welding

WELDING EQUIPMENT & SUPPLY CO., 223 Leib St., Detroit 7, Mich. 40-page tool-steel welding manual and catalogue containing technical information on metallic arc tool steel welding and data on electrodes used. 19

Tap Reference Manual

CHARLES H. BESLY & CO., 118 N. Clinton St., Chicago 6, Ill. Tap reference manual, containing information on selection of taps for various types of work, tap fits, tap drill sizes, tapping speeds, lubricants, and other data. 20

Metallic-Vapor Heat-Treating Furnaces

LITHIUM CO., 111 Sylvan Ave., Newark 4, N. J. Catalogues descriptive of the principle of operation of lithium metallic-vapor heat-treating furnaces. 21

Electric Control Equipment

LEEDS & NORTHRUP CO., 4921 Stenton Ave., Philadelphia 44, Pa. Catalogue N-00A(2) descriptive of Micromax electric control for electrically heated furnaces, ovens, baths, etc. 22

Radius Dressers

U. S. TOOL & MFG. CO., 6906 Kingsley, Dearborn, Mich. Circular describing two new models of radius dressers, one of which serves as an angle correcting dresser. 23

Precision Lathes

SOUTH BEND LATHE WORKS, South Bend 22, Ind. Catalogue 100-D, completely describing the South Bend line of engine lathes, tool-room lathes, and precision turret lathes. 24

Electronic Tempering Control

GENERAL ELECTRIC CO., Schenectady 5, N. Y. Bulletin GEA-4201, entitled "Heat-Treat Your Resistance Welds," describing the use of the GE electronic tempering control. 25

Worm-Gear Speed Reducers

LINK-BELT CO., 307 N. Michigan Ave., Chicago, Ill. Data Book No. 1824, covering the Link-Belt line of worm-gear speed reducers; includes horsepower ratings and other engineering data. 26

Hobs and Hobbing

COLONIAL TOOL CO., LTD., Windsor, Ontario, Canada. Bulletin H-44, entitled "Hobs and Hobbing," containing 48 pages of information of value to tool engineers and shop men. 27

Tool-Steel Welding Electrodes

ALLOY RODS CO., York, Pa. Catalogue containing general instructions for the use of Arcaloy tool-steel welding electrodes; includes engineering data. 28

Welding and Positioning Equipment

RANSOME MACHINERY CO., Dunellen, N. J. Bulletin 2523, covering Ransome welding and assembly positioning equipment. 29

Flow-Master Pumps

MARCO CO., INC., 511 Monroe St., Wilmington 17, Del. Leaflet descriptive of the Flow-Master pump, designed to transfer, meter, or proportion any product that can be pumped. 30

Collet Chuck Drill Adapters

ZEPHYR MFG. CO., Inglewood, Calif. Bulletin A29-74, describing the Zephyr positive-drive collet chuck drill adapter, which enables the flute ends of broken twist drills to be utilized. 31

Threaded Fasteners

INDUSTRIAL SCREW & SUPPLY CO., 711 W. Lake St., Chicago 6, Ill. General catalogue and Price List No. 44, covering threaded fasteners; includes technical data of use to the buyer. 32

Flow Heat-Treatment

A. F. HOLDEN CO., New Haven 8, Conn. Bulletin 115, descriptive of the Holden flow heat-treatment, indicating the steps, baths, temperatures, times, and equipment used. 33

Torque Tools

APCO MOSSBERG CO., 110 Lamb St., Attleboro, Mass. Booklet on torque tools, giving data for determining relative shearing torques for bolts, machine screws, and studs. 34

Miniature Ball Bearings

MINIATURE PRECISION BEARINGS, Keene, N. H. Bulletin 44, covering the complete line of Miniature precision ball bearings for instrument, industrial, and special use.35

Screw-Thread Comparator Charts

ENGINEERS SPECIALTIES DIVISION, 980 Ellicott St., Buffalo 8, N. Y. Bulletin on screw-thread comparator charts. 36

Meehanite Castings

MEEHANITE RESEARCH INSTITUTE OF AMERICA, INC., Pershing Square Bldg., New Rochelle, N. Y. Bulletin 20, entitled "Meehanite—The Metal for Wear-Resisting Castings." 37

Springs

MUEHLHAUSEN SPRING CORPORATION, 201 Michigan Ave., Logansport, Ill. Booklet entitled "Springs

Designed for the Job Improve Product Performance." 38

Couplings

PHILADELPHIA GEAR WORKS, INC., Erie Ave. and G St., Philadelphia 34, Pa. Bulletin 150, illustrating and describing the line of flexible and rigid couplings made by this company. 39

Adjustable Cutters

ROBERT H. CLARK CO., 9330 Santa Monica Blvd., Beverly Hills, Calif. Catalogue 44, descriptive of the company's complete line of adjustable cutting tools, including counterbores, hole cutters, etc. 40

Carbide Cutters

M. A. FORD MFG. CO., INC., 737 W. First St., Davenport, Iowa. Bulletin containing data on Ford carbide rotary cutters, listing new sizes and shapes. 41

Dust Collectors

AGET-DETROIT CO., 602 First National Bldg., Ann Arbor, Mich. Catalogue of "Dustkop" self-contained, individual type dust collectors for grinders and sanders. 42

Plating Equipment

UDYLITE CORPORATION, 1651 E. Grand Blvd., Detroit, Mich. Circular illustrating and describing the Udylite Handiplater for plating odd lots of small parts. 43

Radiation Pyrometers

BRISTOL CO., Waterbury 91, Conn. Bulletin P-1202, containing data on the application, operation, and design of Bristol radiation pyrometers. 44

Micro-Form Grinders

SHEFFIELD CORPORATION, Dayton 1, Ohio. Booklet covering the Sheffield Micro-Form grinder for the precision production of profiles directly from the drawing. 45

Diamond Tools

LARCO DIAMOND TOOLS, 551 Fifth Ave., New York 17, N. Y. Catalogue covering the various types of diamond tools made by this concern for industrial use. 46

Welding Symbols Chart

HOBART BROTHERS CO., Hobart Square, Troy 1, Ohio. Wall chart showing the welding symbols recommended as standard by the American Welding Society. 47

Electronic Supplies

WALKER-JIMIESON, INC., 311 S. Western Ave., Chicago 12, Ill. Monthly publication listing electronic supplies available for immediate delivery. 48

Drop-Forgings

DROP FORGING ASSOCIATION, 605 Hanna Bldg., Cleveland, Ohio. Booklet entitled "Metal Quality—Hot-Working Improves Properties of Cast Metal." 49

Perspective Drawing Aids

CHAS. W. DOWNS & SON CO., 2280 Fourteenth St., Detroit 16, Mich. Circular describing the Truper line of true perspective drawing aids. 50

Lift-Trucks

LYON-RAYMOND CORPORATION, 1696 Madison St., Greene, N. Y. Bulletin 136, describing applications of Lyon-Raymond hydraulic high-lift trucks. 51

Magnet Wire

GENERAL ELECTRIC CO., Schenectady 5, N. Y. Circular GEA-3911, on Formex magnet wire, covering advantages, types, and applications. 52

Grinding Machines

NORTON CO., Worcester 6, Mass. Bulletin announcing the new Norton Bura-way precision tool and form grinder. 53

Drill Press Turret Attachment

MACHINE DEVELOPMENT CO., 516 Fifth Ave., New York 18, N. Y. Circular announcing a new drill press turret attachment. 54

Lift-Trucks

MERCURY MFG. CO., 4044 S. Halsted St., Chicago 9, Ill. Bulletin

To Obtain Copies of New Trade Literature

listed on pages 185-188 (without charge or obligation), fill in below the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail within three months of the date of this issue to:

MACHINERY, 148 Lafayette St., New York 13, N. Y.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Name ..... *Position or Title* .....

[This service is for those in charge of shop and engineering work in manufacturing plants.]

Firm .....

Business Address .....

City ..... *State* .....

[SEE OTHER SIDE]

7-11, covering Mercury tractors, trailers, and lift-trucks. 55

Collapsible Taps

LANDIS MACHINE CO., Waynesboro, Pa. Bulletin G-94, descriptive of Landis Style ALT collapsible taps. 56

Retaining Rings

NATIONAL LOCK WASHER CO., Newark, N. J. Bulletin on square and round section heat-treated spring steel retaining rings. 57

Hard-Facing Rods

HAYNES STELLITE CO., Kokomo, Ind. Pamphlet entitled "Cut Costs with Haynes Stellite Hard-Facing Rods." 58

Toggle-Action Clamps

KNU-VISE INC., Detroit 16, Mich. Catalogue covering the complete line of toggle-action clamping devices made by the company. 59

Carbide-Tipped Tools

JESSOP STEEL CO., Washington, Pa. Catalogue on Malta carbide-tipped tools. 60

* * *

According to *Metals and Alloys* infantrymen's helmets are being made from one of the toughest steels known, Hadfield manganese steel. The helmets are formed in one draw in giant power presses.

Tool and Die Manufacturers Association's Statement of Objectives

At the annual meeting of the National Tool and Die Manufacturers Association recently held in Cleveland, Ohio, the following statement of policy and objectives was issued:

It is the purpose of the National Tool and Die Manufacturers Association:

1. To contribute in the highest possible degree toward the speedy and successful culmination of the war.

2. To insure the maximum use of the tool and die industry in the reconversion period.

3. To promote the fullest possible utilization of the facilities of the tool and die shops in normal times.

4. To oppose bureaucratic ideas and unfair government competition and inequalities to small plant owners.

5. To expend efforts to assure the tool and die shop owners of this country that they may have the most efficient and equitable conditions under which to carry on their business in harmony with one another.

6. To develop a sound apprenticeship program.

The Association's headquarters are at the Southern Bldg., Washington, D. C. M. W. Rowell is general manager.

New Process for Lengthening Thread Gage Life

A welding process for lengthening thread gage life has been announced by the George O. Griffin Co., 1300 W. Hadley St., Whittier, Calif. This process is used both in making new gages and in salvaging old ones that have worn beyond the allowable tolerances. Worn gages are reclaimed by removing the threads, welding on a solid deposit of chromium-carbide alloy, and then grinding the threads from the solid in this wear-resistant deposit.

New gages are similarly constructed by welding the alloy on prepared blanks. The threads, therefore, are of chromium-carbide alloy from the crest to well below the root of the thread. Exceptionally long life is claimed for these gages. Plug gages are furnished in sizes from 3/8 inch up, and thread ring gages from 7/8 inch up.

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described on pages 192-214 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning machine as described in November, 1944, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

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To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on pages 182-183, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning name of material as described in November, 1944, MACHINERY.

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[SEE OTHER SIDE]

Machine Tool Builders Consider Post-War Problems

At the annual meeting of the National Machine Tool Builders' Association at Hot Springs, Va., October 19 and 20, post-war problems were given main consideration. The industry has given such a remarkable account of itself during the war years, increasing its production to seven times the largest peacetime production ever reached, that obviously the return to post-war peace conditions will present many difficult problems. Several of these were touched upon by the president of the Association, James Y. Scott, president of the Van Norman Co., Springfield, Mass., in his opening address, "Guide-Posts in a Period of Transition." Another address dealing with problems of particular importance to the machine tool industry at the present time was that of John S. Chafee, director of the Tools Division of the War Production Board, who discussed "Present Tools Division Plans and Activities."

Alexander G. Bryant, vice-president, Cleereman Machine Tool Co., who is chairman of the Association's committee on Government Relations, spoke on "The Situation in Washington," while J. A. Krug, chairman of the War Production Board, spoke on "From War to Peace," outlining the policies of the War Production Board in the reconversion of industry to peacetime production.

Special industry problems were dealt with in the second session of the meeting by several men unusually well qualified to discuss the problems. Walter K. Bailey, vice-president, the Warner & Swasey Co., Cleveland, Ohio, who is chairman of the Association's committee on Sales and Service, took as his subject "New Selling Problems," while William P. Kirk, vice-president, Pratt & Whitney Division, Niles-Bement-Pond Co., West Hartford, Conn., spoke on "Industry Planning in the Machine Tool Field." Mason Britton of the Surplus Property Administration, Washington, D. C., gave an interesting address relating to the industry, entitled "A Veteran Looks at His Industry."

The important markets of the industry were dealt with in two addresses—one by Paul Garrett, vice-president, General Motors Corporation, on "The Automobile Industry," and the other by John H. Abbink, vice-president, McGraw-Hill Publishing Co., who discussed "The Machine Tool Markets Abroad."

At the annual dinner, a subject uppermost in the minds of all men connected with industry was dealt with by Robert M. Gaylord, president of the Ingersoll Milling Machine Co., Rockford, Ill., and president of the National Association of Manufacturers, who spoke on the subject "The Future of Private Enterprise."

Problems of the Transition Period

In his address dealing with problems of the period of transition, James Y. Scott, president of the Association, considered many important questions now receiving the attention of all the members of the Association. He called attention to one of the most important accomplishments of the Association during the past year—the development and submission to the Government of a plan for the disposal of Government-owned machine tools. This plan has received the careful and favorable consideration of the office of the Surplus War Property Administrator. Of equal importance have been the activities of the Association with respect to renegotiation.

Other important activities during the past year are the satisfactory conclusion of the conferences of the Association's committee having to do with the adoption of electrical standards. Still other problems that have received serious consideration are questions of cancellations of contracts, inventories, and the volume of business that organizations in the machine tool industry should try to obtain after the war.

Active Post-War Demand Expected

In the course of his address Mr. Scott said: "I think that the post-war demand for machine tools for peacetime manufacture is going to be consistent; I think it is going to be large, in comparison with the average pre-war experience; and I think that if we can just take proper measures to tide us over the intervening period, we are going to emerge some few years from now as a far larger industry than we were when we entered this war.

"The basic reasons for my thinking in this direction are founded on two premises: (1) During the war, America has become committed to precision manufacture, and precision manufacture of peacetime products will require large quantities of new machine tools, because there are limits to the extent to which war machine tools can be adapted to peacetime purposes; (2) America is committed to the principle of high-

level employment made possible by mass production and low costs. The machine tool is the means whereby American industry can achieve the low costs that will make possible the mass markets to insure high-level employment.

"These two reasons eventually point to large post-war business for the machine tool industry, but the transition period is bound to be difficult and will be seriously complicated because of the problem of machine tool surpluses." Mr. Scott pointed out that the sooner these surplus machine tools can be cleared off the market the better. Nothing is to be gained by trying to hold back the disposal of these machines.

"Many of America's industries—the automobile industry in particular—have carefully worked out plans for immediate peacetime production on a large scale the minute war production ceases. Now, if reconversion can be done rapidly enough, there will be a minimum of employment dislocation between war and peace, and pay-envelope buying power will aid in supporting the mass production programs that the customers for machine tools are planning. This is the road that leads to continued high-level employment in post-war years.

"In order to reconvert quickly, many industries, and the automobile industry in particular, must have certain types of machine tools which it cannot get either from the machine tools now on the factory floors in that industry or from the wartime machine tool supply. These key machine tools which the automobile industry needs, and needs right away, it must have if it is to be able to effect a quick conversion from war to peace. It is difficult under existing conditions for the machine tool industry to meet this demand.

"Unless the Government releases its restrictions upon our production of machine tools for peacetime purposes, then, within six months from today, the industry will be accused of being the 'bottleneck of peacetime employment,' just as it was called the bottleneck of war production. The Government and the various governmental agencies concerned with this problem must give the machine tool industry the right to build and to ship immediately certain critical machine tools needed for reconversion. Otherwise the post-war re-employment program will be greatly hampered. If we are going to win the peace we must start right now."

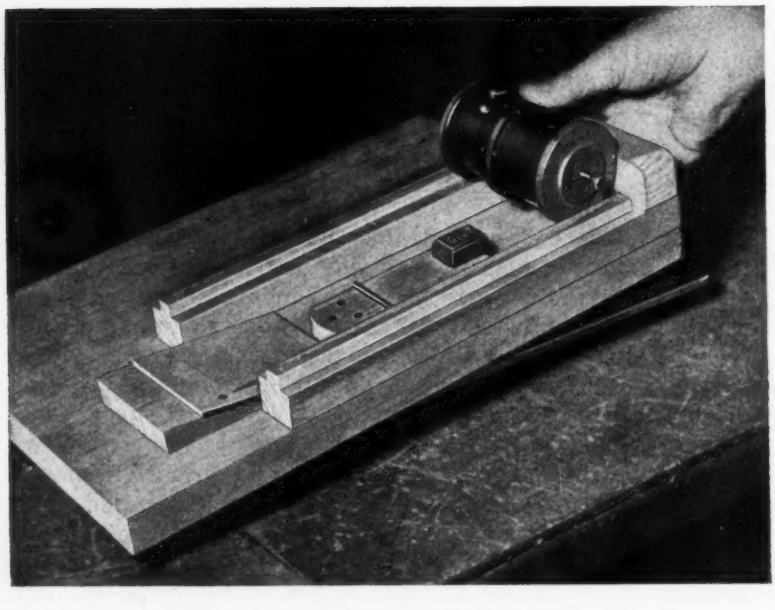
Joseph L. Trecker, vice-president of the Kearney & Trecker Corporation, Milwaukee, Wis., was elected president of the Association, to take office at once; William P. Kirk, vice-president, Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford, Conn., was elected first vice-president.

* * *

Simple Marking or Stamping Fixture for Small Cylindrical Parts

A fixture for stamping identification marks on assembled units of small instrument motors has been designed by P. S. Boucher, a tool-room employe at one of the General Electric Co.'s plants. The press, which replaces various hand methods, saves considerable time and insures perfect imprints.

A standard printing ink of high viscosity is used with the press. A wooden frame with tracks to fit the motor is placed on an incline. The motor is then rolled slowly along the track. Rubber type is used on a hinged pallet, so that it lies flat between the tracks and prints on the motor housing as it rolls over the type. The rubber type can be quickly and easily re-inked by folding the pallet back 180 degrees to an inking surface.



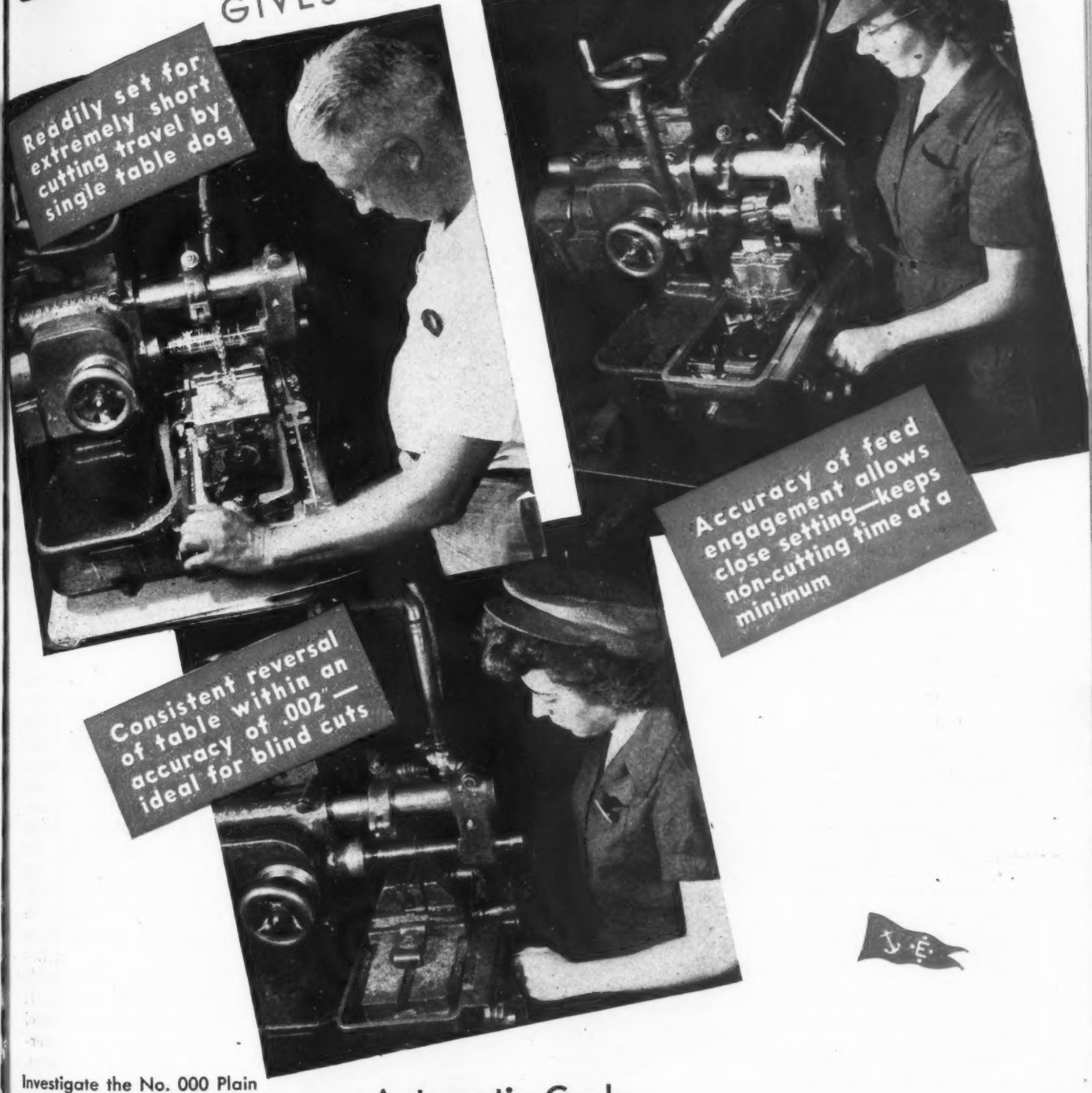
Simple Fixture Used to Mark Small Motors

* * *

More than 250 veterans of World War II are now employed in the Mansfield Appliance Division of the Westinghouse Electric & Mfg. Co. under the plant's War Veterans' Reinstatement Plan. The plan calls for the re-employment of all Westinghouse veterans and, whenever possible, for the hiring of veterans who worked for other firms before entering the service. Over 917 employes of the plant have been given military leaves of absence. Up to the present time, 83 have returned to work.

No. 000's *Simple and Rapid Operation*

GIVES GREATER MILLING EFFICIENCY



Investigate the No. 000 Plain Milling Machine for the rapid milling of your small parts.

B·S BROWN & SHARPE MFG. CO.
PROVIDENCE 1, R. I., U. S. A.

Automatic Cycle–
Simply load . . . pull starting lever —table returns automatically to starting position at completion of cut

BROWN & SHARPE

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

DeVlieg New Model "Jigmil"

The DeVlieg Machine Co., Ferndale, Mich., has developed a new Model 3-B bar "Jigmil," shown in Figs. 1 and 2. In operating principle, this new model is similar to its predecessor—the Model 3-A—but embodies several improvements and refinements. The capacity range has been slightly increased, and important features have been added to increase accuracy and speed up production.

Among the new features of special interest are automatic positioning, which makes it possible to automatically locate the spindle and table, changing them from one position to another with a setting accurate to 0.0001 inch by using precision end-measuring rods and push-button controls. With this equipment, it is possible for an unskilled operator to obtain laboratory accuracy quickly. Another improvement is the new type of "feather-touch" controlled-pressure locking arrangement that firmly locks the slides with controlled uniformity. This results in uniform pressure on the oil film and prevents errors resulting from uneven manual locking. All of the slide and structural elements have been increased in size and length so as to supplement the new control equipment.

The automatic table retraction arrangement has been improved to insure greater accuracy. Retraction of the table and work from the cutting position is under push-button control. Push-button controls are also used to unlock the table, retract it the desired distance from the cutting position, automatically return it to the stopping place, and lock it accurately in the cutting position within limits of 0.002 inch. The new finger-tip control permits all functions of the machine to be controlled from one position. This control station is mounted on the spindle head, and has the advantage of traveling with the head. Only standard controls are used. The spindle has been made heavier, and the spindle-head dimensions have been increased. The design of the gear train has been improved, and all gears are now finish-shaved to insure quiet, smooth operation.

The machine is equipped with five motors—a 3 3/4- to 7 1/2-H.P., 900- to 1800-R.P.M., two-speed motor for the spindle-head drive; a 1-H.P., 1200-R.P.M. motor for the rapid traverse movement to the head and table; a 1/2-H.P., 400- to 1200-R.P.M. motor for the milling power feeds to the head and table; a 1/2-H.P., 1200-R.P.M. motor for the automatic retraction of the table; and a 1/3-H.P., 1200-R.P.M. motor for the rapid traverse movement of the bar. All motor mountings are accessible, and electrical installation is designed for full compliance with recently established standards.

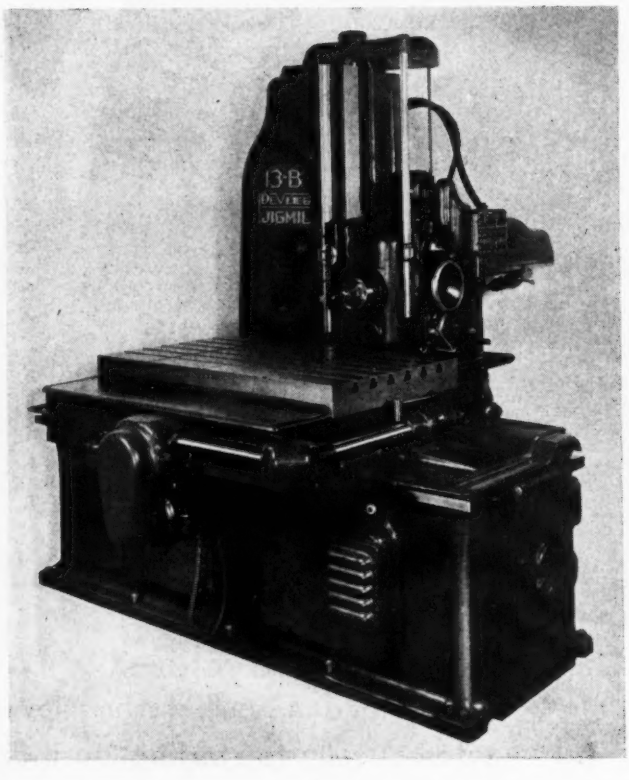
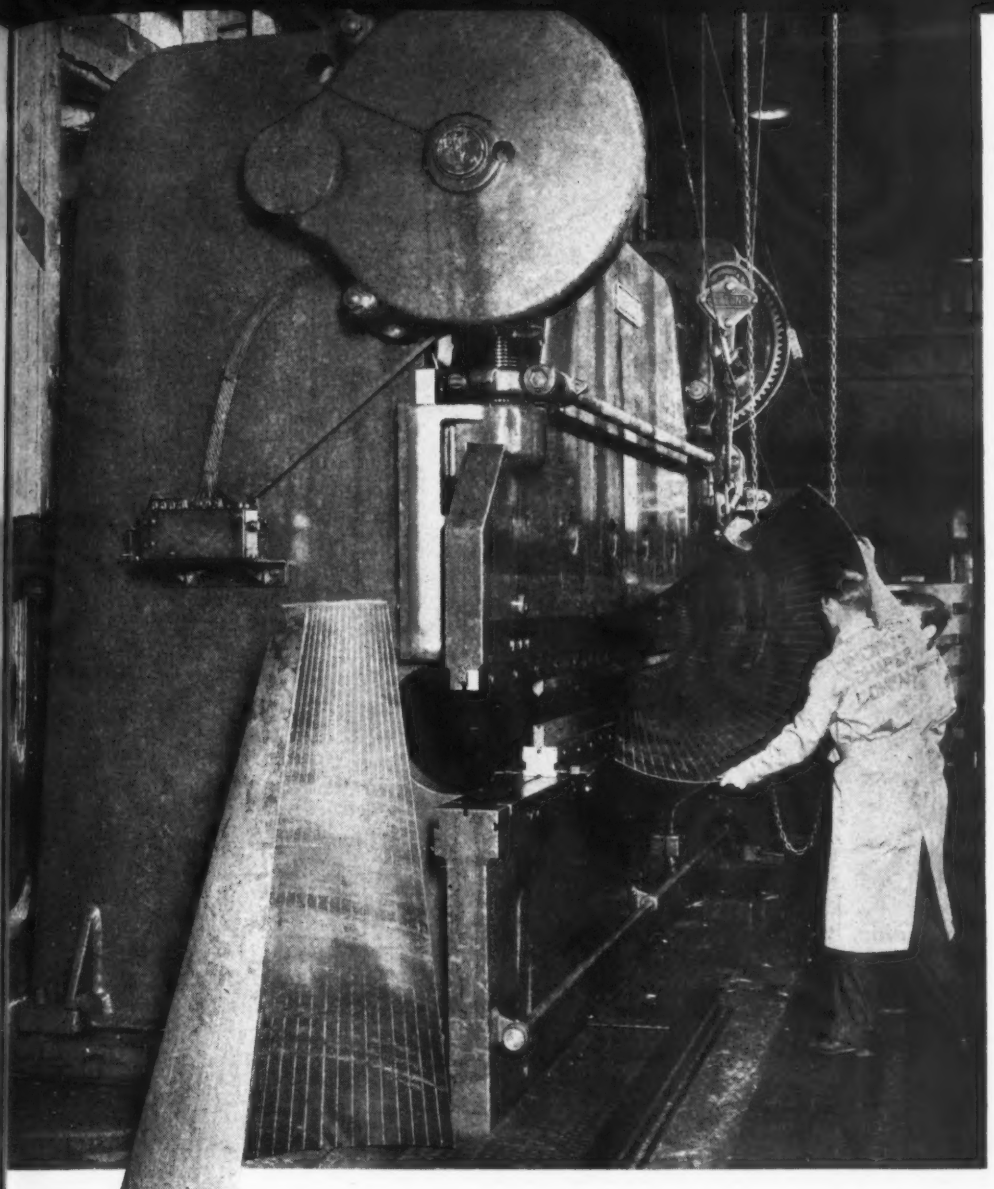


Fig. 1. DeVlieg Improved Model "Jigmil" Equipped for Accurate Automatic Positioning

The machine has twenty-four spindle speeds ranging from 22 to 1200 R.P.M. Bar feeds ranging, in steps of 0.001 inch, from 0.001 to 0.016 inch are available. Milling feeds to the table and the head are selected by means of a dial quick-change mechanism within a range of from 0.3 inch to 15 inches per minute. The table is 30 by 48 inches; it has a horizontal travel of 48 inches and a vertical travel of 37 inches, starting with a center 1 inch below the top of the table and extending to 36 inches above the top.

The bar is 3 inches in diameter, has a movement of 16 inches,

To obtain additional information on equipment described on this page, see lower part of page 188.



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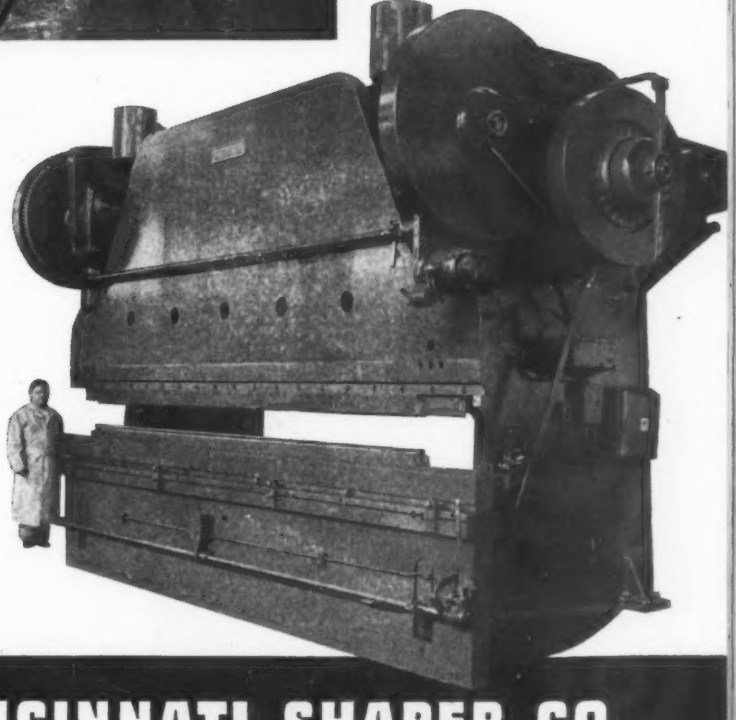


THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

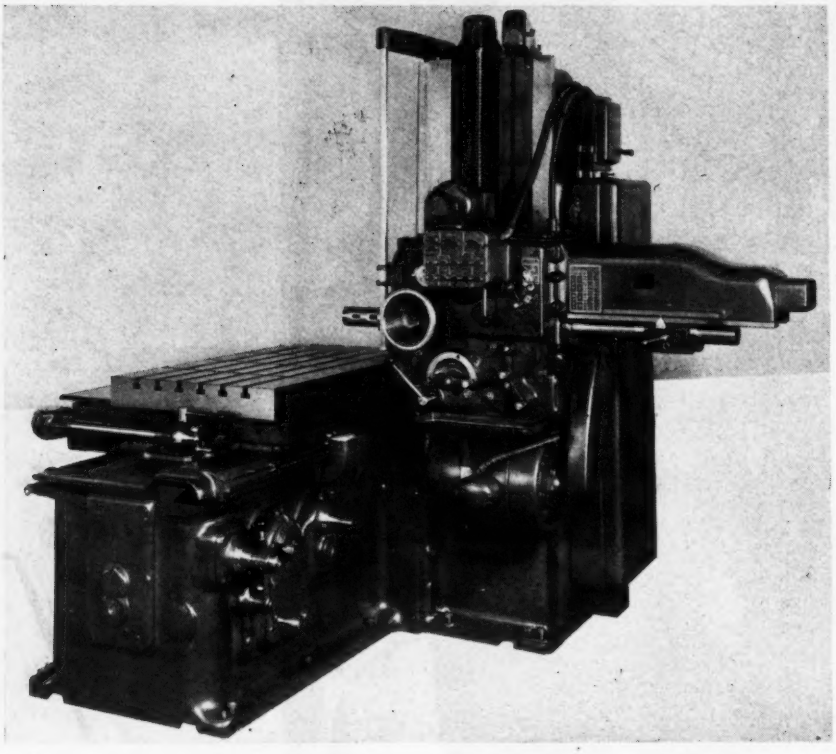


Fig. 2. View Showing Operating Controls of New DeVlieg "Jigmil"

and is provided with means for obtaining an additional resetting movement of 6 inches. The retraction movement of the table has a range of 16 inches. The machine is equipped with anti-friction bearings and automatic lubrication. The weight is 20,000 pounds. 71

Fulmer Piston-Ring Lapper and Aircraft-Engine Connecting-Rod Borer

The C. Allen Fulmer Co., 1217 First National Bank Bldg., Cincinnati, Ohio, has recently placed on the market a hydraulic piston-ring lapper which has been widely used in the field and in base engine overhauling shops of our air forces. This machine, shown in Fig. 1, is now available for civilian use. It is designed to facilitate accurate fitting of piston-rings, reduce "break in" time, and eliminate the necessity for tearing down engines because the rings fail to seal properly. It can be easily adjusted to handle cylinders of all diameters used in aircraft engines.

A full set of rings in all sizes up to a maximum of 6 3/8 inches in diameter can be lapped into their cylinder barrels on the regular lapper, but machines for handling larger sizes can be supplied on special order. The lapping spindle of this machine is given a half revolution during the full forward stroke, but does not rotate on the return stroke. At the end of each reciprocating cycle, the spindle is rotated a certain amount, so that there is no possibility of the abrasive traveling over the same path on the succeeding stroke. The spindle operates in a bath of oil, and carries a wiper seal to protect it against dirt and grit. The stroke setting spaces can be adjusted to give working strokes of from 2 to 12 inches. A reset counter indicates the number of strokes for each operation.

Equipment includes a Vickers hydraulic pump driven by a 2-H.P. motor, and tank, all incorporated in the machine base. Adapter plates can be supplied to hold any size cylinder. Quick-action clamps lock the cylinder in place.

In addition to the piston-ring lapper described, the company has also made available for civilian use the aircraft-engine connecting-rod

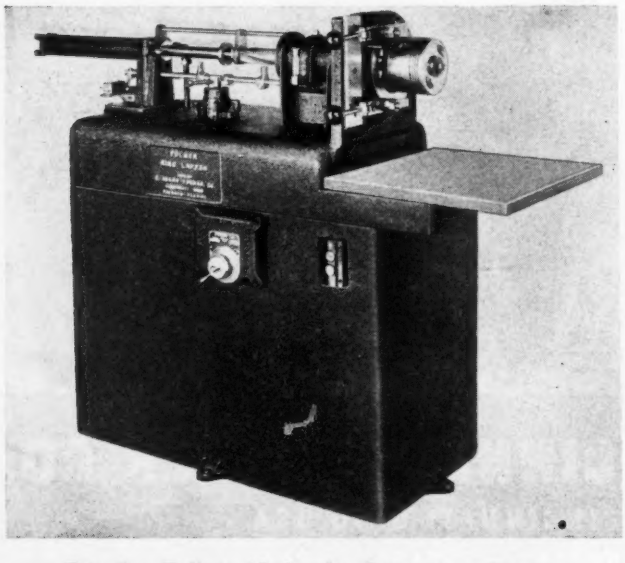


Fig. 1. Fulmer Hydraulic Piston-ring Lapper

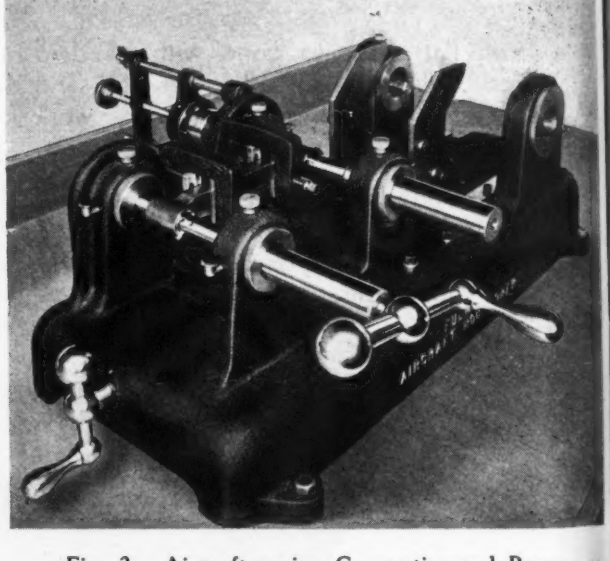
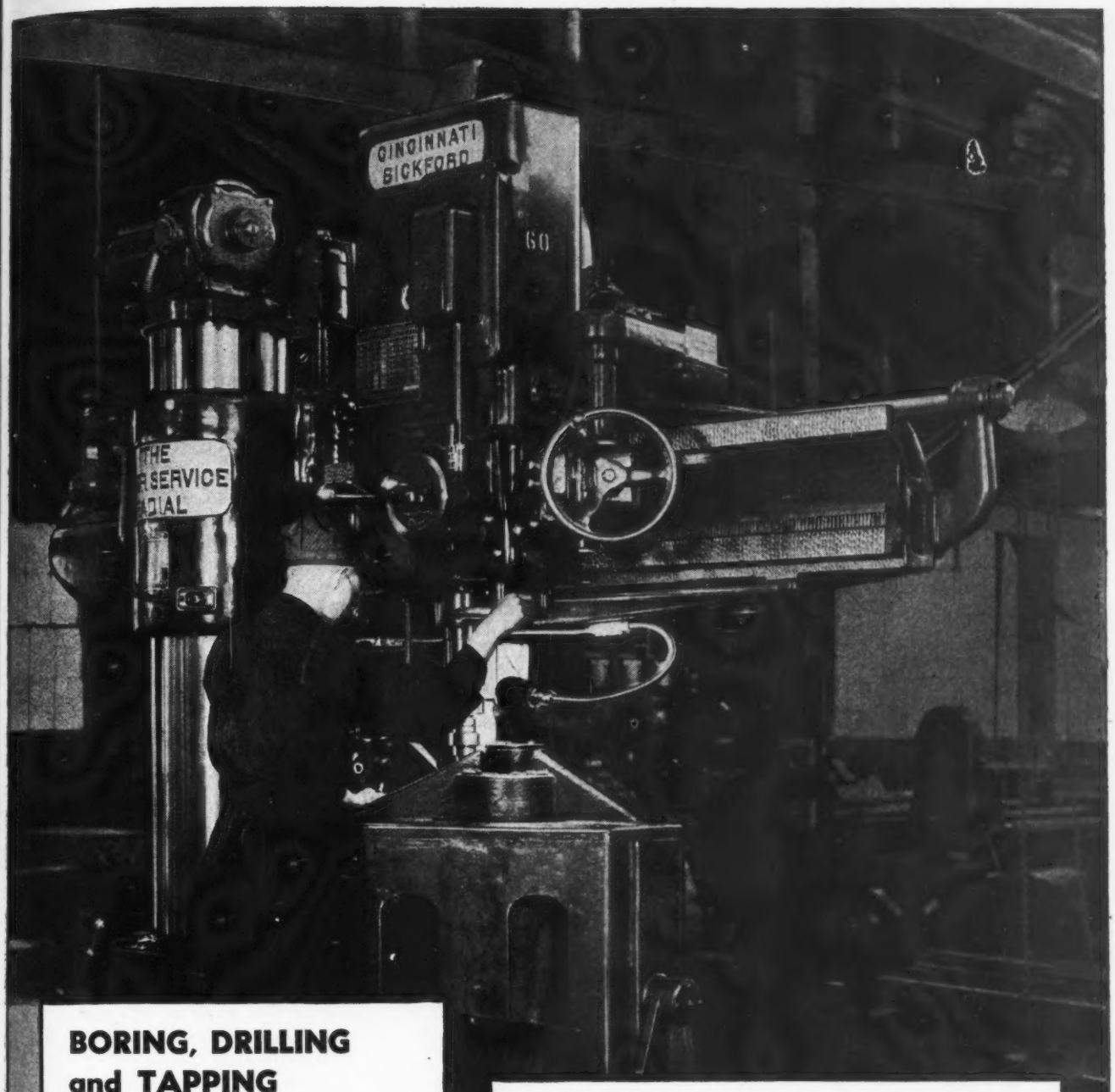


Fig. 2. Aircraft-engine Connecting-rod Borer

To obtain additional information on equipment described on this page, see lower part of page 188.



BORING, DRILLING and TAPPING GUN MOUNT CASINGS to close tolerance on a

SUPER-SERVICE RADIAL

ARMY E NAVY

HERE'S a Super-Service Radial at the plant of American Machine and Metals, Inc., in Illinois, being used to bore, drill and tap holes up to 4.173" diameter on a gun mount pedestal casing approximately 4' high by 3' across base. Tapping involves 22 holes of various sizes. Limit of accuracy is .001. While production figures are not available for publication, we can say with assurance that the floor-to-floor time is exceedingly low. Summed up in the words of the operator "This machine handles easily—does a good job." Such commendation typifies the kind of report we receive from operators everywhere who speak from actual experience with Super-Service Radials.

Detailed information available on request.

THE CINCINNATI BICKFORD TOOL CO. OAKLEY, CINCINNATI 9, OHIO, U. S. A.

borer shown in Fig. 2. This borer is designed to enable any competent shop man to attain factory accuracy and finish on connecting- or articulating-rods of aircraft engines. No hand-scraping or fitting is required when this rod-borer is used, the bored holes being round and straight within exceptionally close limits. They have a mirror-like smoothness and are finished ready for assembly.

The machine is simple to operate and easy to set up for any size rod in common use. It can be employed for boring crankpins, piston-pins or knuckle pins. In addition to boring operations, facing, chamfering, or radius-forming of the bearings can also be done to extremely close limits of accuracy with respect to size, straightness, roundness, and parallelism. The machine is portable and can be used in the shop or in the field.

Six adjustable boring feeds are available, ranging from 0.0015 to 0.009 inch per revolution of the boring-bar. The bar can be power-operated through the use of a 1/2-inch portable electric drill or it can be rotated by hand if no power is available. The bar can be held in the correct longitudinal position for facing by employing the hand-feed. This permits facing bushings to width and machining chamfers or inside radii on any of the bored holes. As optional equipment, turning heads can be supplied for machining the outside diameter of the bearing shells for the rods of an "in line" engine.

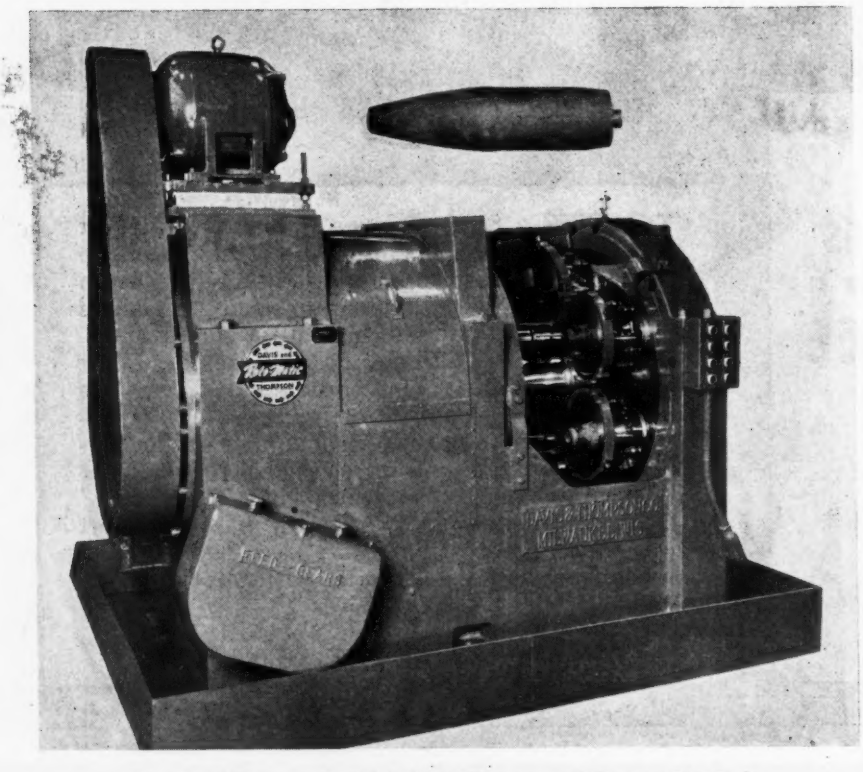
After the boring operation is completed, the machine can be used for accurate checking of the rods with respect to parallelism of the two bored holes and for detecting twist, thus eliminating the need for additional checking equipment.....72

Six-Station Shell Nose Boring and Facing Machine

A single-end, horizontal, rotary, continuous boring machine with six stations, designed for the boring and facing of 155-millimeter shells, has been developed by the Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis. A special feature of this machine is the automatically operated collet chucks, which insure holes that are concentric with the outside surface of the shell within exceptionally close limits. The shells are loaded manually into the machine from a conveyor and located for length automatically from the boat-tail end by a spring cam and a positive stop. The chucks which hold the parts are closed and their rotation started automatically.

When the machine cycle is started, the spindle carrying the roughing, finishing, and facing tools is fed by means of a cam to the correct depth. The machining operations are completed after three-fourths of a revolution of the rotating member. At the predetermined point where the hole is completed and the tool is withdrawn, rotation of the machine is stopped, the clutch opened, and the shell ejected into a conveyor.

The machine is timed for a production rate of 250 shells per hour with a feed of 0.007 inch per revolution at an effective spindle speed of 750 R.P.M. With the spindles operating at 650 R.P.M. and the chucks at 100 R.P.M., the time required to complete the cycle is 84 seconds. The machine weighs 18,660 pounds. 73



Davis & Thompson Shell Nose Boring and Facing Machine

L & N New Temperature Control System

In order to apply to electrically heated furnaces, ovens, and similar units as dependable a regulation of temperature as the position-adjusting type of Micromax electric control has brought to fuel-fired furnaces, the Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa., has just brought out a new type of Micromax electric control known as the "duration-adjusting" type.

This control system not only regulates electric input to hold temperature at a selected control point or to a predetermined program, but is said to hold it there so dependably that the most efficient balance between product uniformity, speed of output, and flexibility of operation is obtained.

By means of an "on-off" contacting system, the electric current needed to keep the temperature to the required values is fed to the heating unit. The input is either "full-on" or "full-off," and the time the current is on and off is automatically controlled.

The new system provides automatic droop-correction, and can be equipped with "overshoot" control, which is of value when the furnace or other unit is coming up to temperature. 74

To obtain additional information on equipment described on this page, see lower part of page 188.

Greater ACCURACY REQUIRED

New Production Speeds and Improved Part Finish Place Emphasis on PRECISION-MADE Cutting Tools

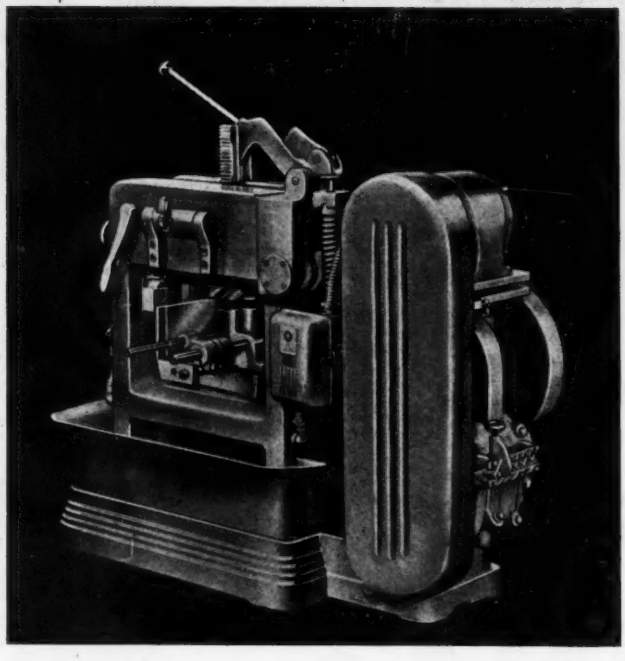
XLO

Since 1919 The Continental Tool Works (a division of Ex-Cell-O Corporation) has been producing special and semi-standard cutting tools to customers' drawings or part prints—until today the Continental name in the cutting tool field is commonly used as another word for "accuracy and quality." This long experience, coupled with the most modern and complete facilities, makes Continental the first choice as a cutting tool source for manufacturers planning their re-tooling for tomorrow's huge production. *Find out now how you can be assured of high production efficiency*—get in touch with the nearest Ex-Cell-O representative or write to Continental Tool Works Division, Ex-Cell-O Corporation, Detroit 6, Michigan.

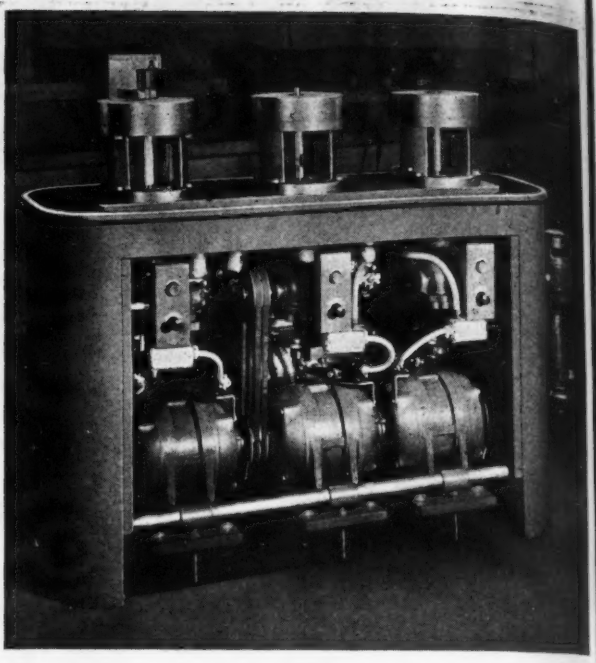
EX-CELL-O CORPORATION

DETROIT 6, MICHIGAN

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES • BROACHES AND BROACH SHARPENING MACHINES • HYDRAULIC POWER UNITS GRINDING SPINDLES • CONTINENTAL CUTTING TOOLS • DRILL JIG BUSHINGS • TOOL GRINDERS • FUEL INJECTION EQUIPMENT R. R. PINS AND BUSHINGS • PURE-PAK PAPER MILK BOTTLE MACHINES • PRECISION AIRCRAFT AND MISCELLANEOUS PARTS



Peerless Metal-cutting Saw with Mechanical Drive and Finger-tip Control of Feed Pressure



Prutton "Tapmaster" with Panel Removed to Show Individual Drives to Spindles

Mechanically Driven Metal-Cutting Saw

A metal-cutting saw with complete mechanical drive, four-sided saw frame, and finger-tip control of the feed pressure has been brought out by the Peerless Machine Co., 1600 Junction Ave., Racine, Wis. This saw, termed the "Mechani-Cut" model, is designed to cut at high speed and with a high degree of precision. It is convertible to manual conveyor operation and is made in sizes of 7 by 7, 11 by 11 and 14 by 14 inches.

A new feature of this machine is the highly sensitive rack and pinion feed which compensates for hard spots in the work and varying shapes and types of stock. This feed unit is mounted out of the way of falling chips and coolant spray. Feeding pressures are set by finger-tip control, and can be adjusted to a fraction of a pound. The massive four-sided saw frame surrounds the cutting blade and the work and permits locating bearings to be employed both above and below the blade. Hardened and ground removable inserts take all strain and wear as the saw frame reciprocates, giving sustained cutting accuracy. The Peerless backing-plate block, 1/32 inch above the saw blade, permits maximum cutting pressures to be used without injury to the blade. 75

Prutton "Tapmaster" Three-Spindle Automatic Tapping Machine

The D. H. Prutton Machinery & Tool Co., 5295 W. 130th St., Cleveland 11, Ohio, has recently brought out a three-spindle automatic tapping machine, known as the "Tapmaster," which is designed to tap three different size holes simultaneously. Holes of any size up to 1 inch can be tapped in one, two, or three different sizes of work at the same time. This machine has three motors with separate controls, and in reality, consists of three tapping machines combined in one unit.

Either single or continuous cycle operation can be employed. Pressing the black button of any one of the three tapping units causes the spindle to travel all the way to the top and reverse. Pressing the same button and turning it causes the cycle to be repeated continuously. The machine employs the lead-screw principle, the master nut having a safety feature which prevents excessive vertical pressure on the tap. Positive feed by the lead-screw assists in preventing tearing of the threads. The total lead is held within a tolerance of 0.0005 inch. Holes up to 1 1/2 inches in length can be tapped with threads of any pitch up to 8 threads per inch.

Each unit has its own individual control, actuated by a black start-stop push-button. Should the part become jammed on the up stroke, the operator merely pushes a red button, which stops the motor. Upon pulling out the black button, the machine reverses and returns to the neutral position. Three fixtures can be located on the table facing the operator. By staggering the loading sequence, three parts can be kept in production continuously. The machine has a length of 60 inches, a width of 22 inches, a height of 34 inches, and weighs 2000 pounds. The power is furnished by three 2-H.P. alternating-current motors. 76

Airco Heating Torch with Multi-Flame Tips

A new medium-weight heating torch has been placed on the market by the Air Reduction Sales Co., 60 E. 42nd St., New York 17, N.Y. This torch (Style 9802) is especially designed for concentrated localized heating such as is required for bending, straightening, and shrinking steel plate, as well as for the silver brazing of heavy copper plate in the manufacture of copper pipe. The torch is lighter than previous heating torches,

To obtain additional information on equipment described on this page, see lower part of page 188.

yet its gas capacity is equal to that of regular types.

Five new multi-flame acetylene heating tips, as well as two multi-flame propane heating tips, are available for use with this torch. These seven tips are designed to meet the requirements of all heavy heating jobs. Three mixers can be obtained, one for positive-pressure acetylene, one for low-pressure acetylene, and one for propane. The available extensions include a 12-inch straight extension and 18-, 24-, and 42-inch angular extensions. ----77

Hydraulic Press for Powdered Metal Molding

A hydraulic press designed to simplify powdered metal molding operations and to give a high degree of accuracy and consistently uniform structure density to the finished product has been developed by the Watson-Stillman Co., Roselle, N. J. This press has a 400-ton capacity vertical ram and a 300-ton capacity horizontal ram. It is double-acting, and has controls and means for making adjustments conveniently located for the operator. Continuous performance and exact duplication on production runs are assured by smooth pulsationless pressure, accurate stepless pressure adjustment, and automatic cycle controls. Micrometer adjustment of the pressure is provided on the working stroke. The mold space is 6 inches wide by 7 inches deep by 30 inches long. All working parts are enclosed in a dustproof housing.

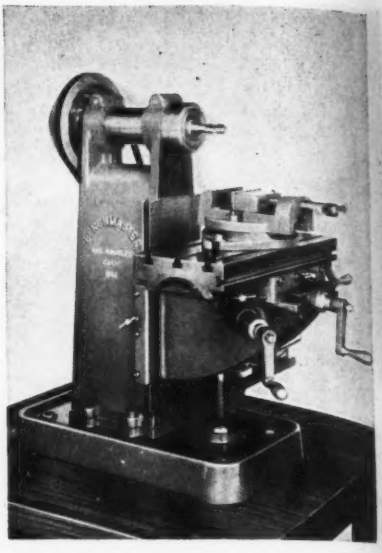
Pressure is provided by a radial piston pump driven by a 30-H.P. motor. This machine is supplied with a push-button solenoid-operated pilot valve for downward and forward movements of the press ram. A hand-lever controls the return movement. Operating speeds of the vertical ram are 238 inches per minute for the advance and return, and 17.5 inches per minute for pressing. The advance and return speeds of the horizontal ram are both at the rate of 21.6 inches per minute. The press is 11 feet 6 1/2 inches high, occupies a floor space of 6 feet 2 inches by 2 feet 7 inches, and weighs approximately 28,000 pounds. ----78

Watson-Stillman Hydraulic Press for Molding Powdered Metal Parts

Improved "Benchmaster" Milling Machine

An improved bench milling machine has been designed by the Benchmaster Mfg. Co., 2952 W. Pico Blvd., Los Angeles 6, Calif., for both vertical and horizontal milling. This machine can be quickly and easily converted from a vertical to the conventional horizontal machine having an over-arm and arbor by simply interchanging the spindle attachments. It is adapted for precision tool work, and can also be used for high production when equipped with a rack-and-pinion feed in place of the hand feed; thus a variety of jobs, such as precision diemaking, die-sinking, slotting, facing, side milling, keyseating, jig boring, angle slotting, etc., can be handled.

This machine is said by the builders to be heavier and more accurate than previous models, and, though low in price, combines these features with a versatility and ease of operation previously found only in larger and costlier machines. Other improvements include ball thrust bearings on the vertical lead-screw; gib locks on the table, saddle, and knee for insuring accuracy once the machine is properly set up; and an equalizing weight distribution that provides sufficient rigidity to permit heavy work to be performed accurately and easily.



Improved Convertible Horizontal-Vertical "Benchmaster" Milling Machine

The horizontal machine includes an over-arm attachment for the arbor outboard support of use when heavy cuts are being taken or when slitting operations are being performed. The vertical milling attachment has a spindle arm which swings 60 degrees each side of the center and is graduated in degrees.

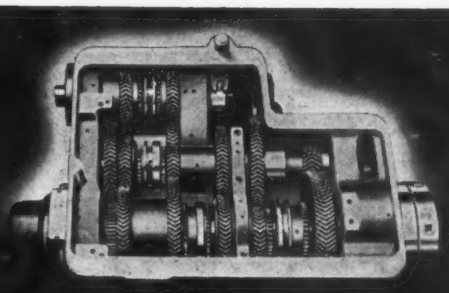
The machine stands 28 inches high with either vertical or horizontal spindle attachments in place, and weighs 215 pounds. The standard table size is 6 by 14 inches or 6 by 18 inches, as required. Longitudinal travel is 8 1/2 inches for the standard table, and 12 1/2 inches for the special table; transverse travel is 5 1/2 inches; and vertical travel is 8 1/2 inches on the vertical machine and 9 1/2 inches on the horizontal machine. A 1/3-H.P. motor operates the V-belt drive. ----79

Pendant Control for Planers

The G. A. Gray Co., 3611 Woodburn Ave., Cincinnati 7, Ohio, has introduced on the market a new method of pendant station control

To obtain additional information on equipment described on this page, see lower part of page 188.

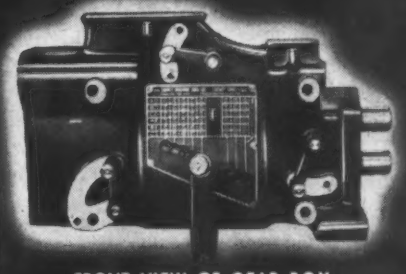
RIGID BED CONSTRUCTION



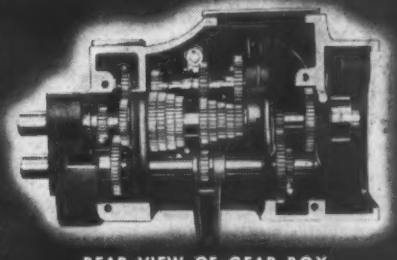
CONTINUOUS TOOTH 30° HELIX HERRINGBONE GEARED HEAD

Sidney

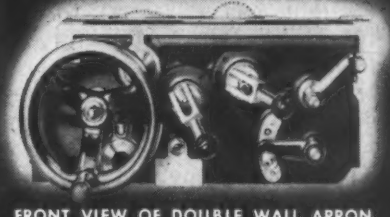
40TH ANNIVERSARY



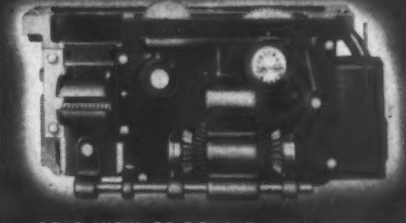
FRONT VIEW OF GEAR BOX



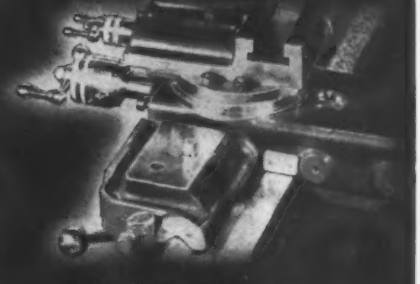
REAR VIEW OF GEAR BOX



FRONT VIEW OF DOUBLE WALL APRON



REAR VIEW OF DOUBLE WALL APRON



SIDNEY COMPOUND REST

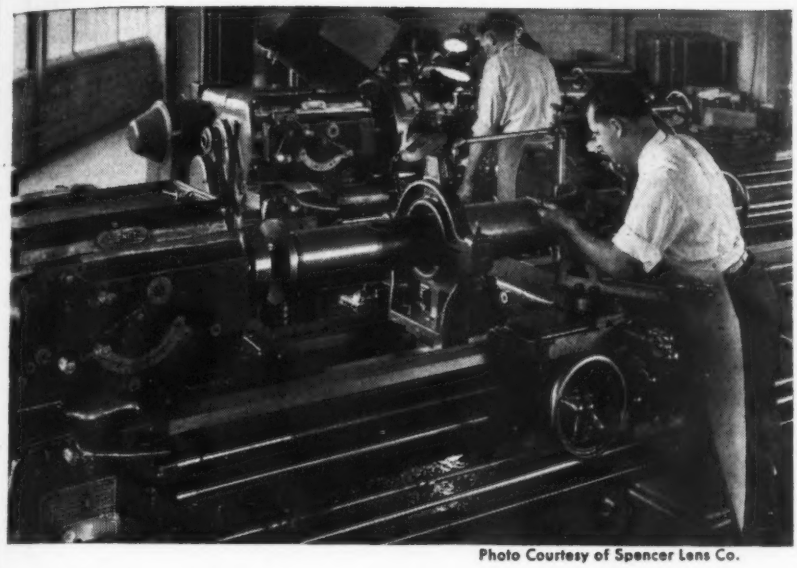


Photo Courtesy of Spencer Lens Co.

For close tolerance work

SIDNEY LATHES

The versatility of Sidney Lathes is demonstrated here where two of the battery of Sidney lathes shown are handling distinctly different jobs—quickly—accurately—easily.

The sturdy bed construction—the perfect alignment of the component parts—the smooth flow of power from the continuous tooth Herringbone Geared Headstock assure continued accuracy and fine finish on all jobs.

When your work calls for extremely close tolerances—for high speeds and heavy feeds—for smooth dependable finish—put it on a Sidney Lathe.

Full descriptive bulletins on all sizes immediately available.

SIDNEY

The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO

for a planer table. This new control is said to effect an increase in production and a saving in tool life when used for certain kinds of work, such as castings with hard spots, castings with sand inclusions, and steel forgings with scale inclusions.

In using this control, the planer operator first locates and identifies the hard spots and inclusions with a chalk mark. The machine is started at the normal cutting speed regularly used on the type of work handled when there are no hard spots to affect the cutting action. As the hard spot approaches the cutting tool, the special button on the control marked "Slow-Down" is pressed, causing the table to slow down to a very low speed as the tool enters the harder metal. When the tool leaves the hard spot, the operator releases the button, permitting the table to resume the normal speed predetermined by the rheostat setting. This control is comparatively inexpensive, and can be applied to any new variable-voltage planer equipment. 80

Meyers "Radiform" Wheel and Tool Forming Attachment

A radius and angle forming attachment that can be equipped with diamond nibs for dressing grinding wheels to the desired radii and angles for form grinding has been developed by the W. F. Meyers Co., Inc., Bedford, Ind. This device can also be used to generate radii and angles tangent to radii on end-mills, die-sinking tools, drills, reamers, etc., in both straight- and spiral-fluted types by presenting them directly to a grinding wheel without preforming the wheel. The collet-holder is designed for quick centering by means of a positive stop. Clearance angles are predetermined, as are the radii and angles to be formed.

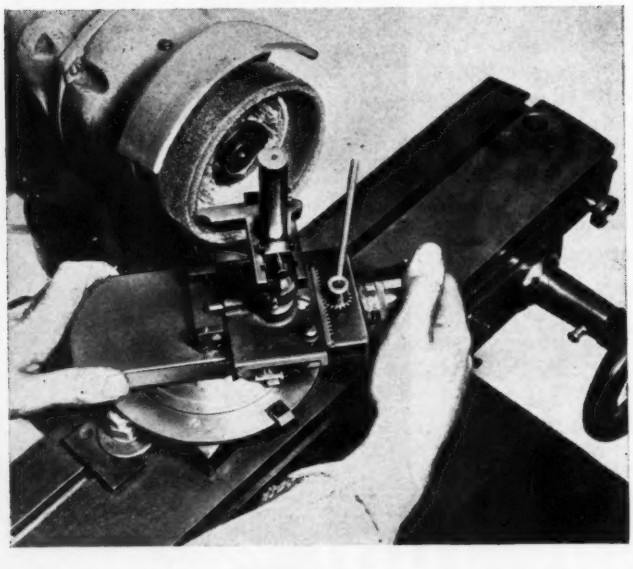
A high degree of accuracy is assured for operations performed with this attachment by making micrometric adjustments before starting the forming operation. The twenty-four-notch indexing head built into the collet-holder permits the forming of both primary and secondary clearances without changing the set-up. The collet-holder is connected to an arm actuated by an adjustable cam so that the radii and angles generated will follow accurately the helix angle of any flute. Either spherical radii or the smaller end radii are formed by micrometer adjustment of the slide.

A swivel base with adjustable positive stop control and vernier dial is used in forming work to any degree-and-minute radii, or radii with tangent angle, if desired. The positive stop control prevents under-cutting, and allows the operator to see the work being formed. This arrangement reduces the time required for finishing the work. Difficult radius-forming jobs previously finished by hand and requiring highly skilled workmen can be done much quicker and with greater accuracy when the tool former attachment is used.

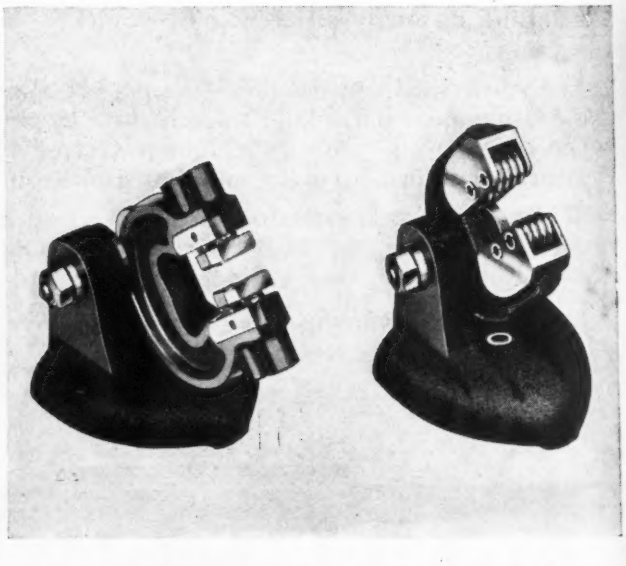
No honing or finish-grinding is required on high-speed tools when the proper wheel is used. Carbide-tipped and inserted tools do not require lapping when formed by a diamond wheel of the proper grit. The attachment can be used for forming concave and convex radii with tangent angles or concave-convex blended radii on tool bits, milling cutters, etc. The attachment can also be used to produce form wheels. The radii and angle forming cutting ends of tool bits, milling cutters, etc., having different front and side clearance angles, can be formed with smoothly blended surfaces in one set-up of the attachment. 81

Taft-Peirce Holder for Snap Gages

A universal snap-gage holder is being placed on the market by the Taft-Peirce Mfg. Co., Woonsocket, R. I., which will accommodate any type of snap gage, including all AGD frames and standard adjust-

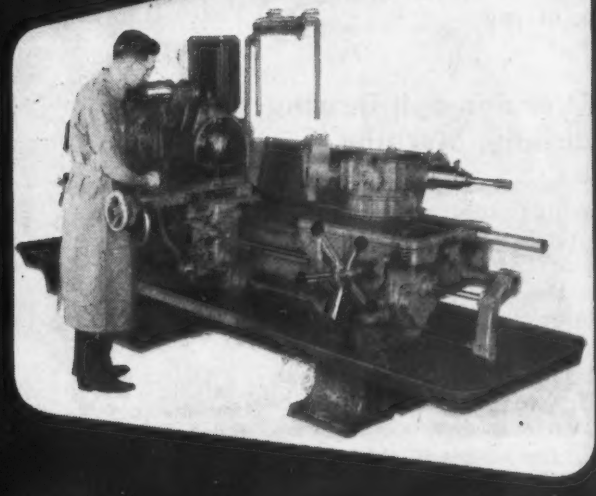


Meyers "Radiform" Wheel and Tool Former Set up for Forming 1/8-inch Radius on Cutting Tool



Snap Gages Mounted in Universal Snap-gage Holders Made by Taft-Peirce Mfg. Co.

To obtain additional information on equipment described on this page, see lower part of page 188.



"TURRET LATHES...Their Operation and Use"

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"TURRET LATHES—Their Operation and Use" is produced in full color and sound. It explains the basic design of various types of lathes, covers the field of turret lathe applications, shows methods of setting up machines for various types of work, familiarizes beginners with the location of controls, feeds and the fundamentals of their use. The turret lathe's versatility on many kinds of production work is vividly portrayed. Clear descriptions, accompanied by excellent photography with many close-ups, make this the most comprehensive and authentic presentation of its kind. "TURRET LATHES—Their Operation and Use" will be loaned without cost except shipping charges to recognized manufacturers, businesses, trade schools, and like organizations upon request. The film is available in 16-mm. size, with sound track. To arrange bookings, write the Gisholt Machine Company for complete information and order blanks. Take advantage of this audio-visual aid in industrial education.

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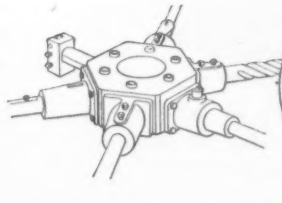


GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

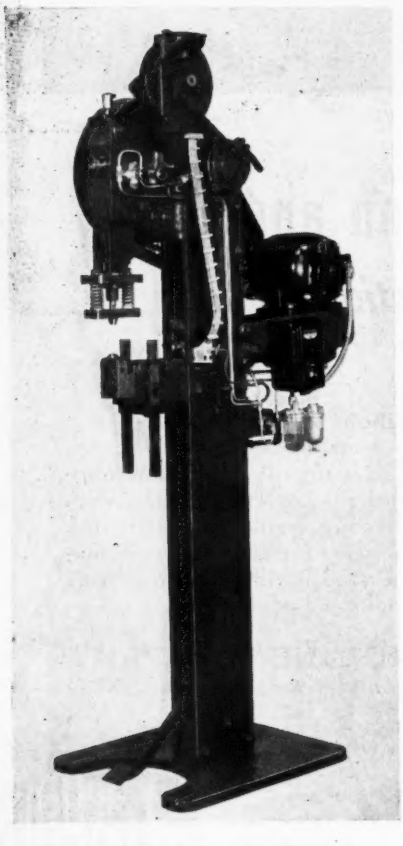
able thread styles. The holder can be clamped at any angle to suit the inspector's convenience. This holder permits standardization on a single piece of equipment, eliminating the need for a special holder for each type of gage. 82

L&R Precision Ball-Bearing Cleaning Machine

A machine for cleaning precision ball bearings has recently been brought out by the L&R Mfg. Co., 577 Elm St., Arlington, N. J., that combines the rotary principle employed in machines previously developed by this company with a new pressure cleaning mechanism. From fifty to one hundred bearings of various sizes can be precleaned in the basket of this rotary cleaner, which is shown in the accompanying illustration. In the pressure cleaning tank at the right, continuously filtered solution under 6 to 10 pounds of pressure is forced through each bearing individually. Filtered compressed air is provided to remove surplus solvent from the bearing while it is still on the pressure cleaning spindle. For this work, an L&R instrument rinsing solution is used.

Machine for Cleaning Ball Bearings, Made by L&R Mfg. Co.

The bearing on the pressure cleaning spindle is rotated alternately clockwise and counter-clockwise to obtain maximum surface coverage by the solvent. The cone head into which the bearing is fitted to receive the cleaning compound is stepped to accommodate eleven sizes of bearings up to a maximum of 2 inches outside diameter. Other cone heads can be made to conform to sizes of bearings specified. The tank in which the pressure cleaning mechanism is located is sealed during operation. A glass lid and a plastic hooded lamp located within the tank opposite the spindle make it possible to observe the work being cleaned. The basket of the rotary cleaning unit has an inside diameter of 5 1/2 inches and is 3 3/8 inches deep. The total weight of the machine is about 200 pounds. 83



"Rivitor" Built by the Tomkins-Johnson Co. for Riveting Bail Ears to Pails

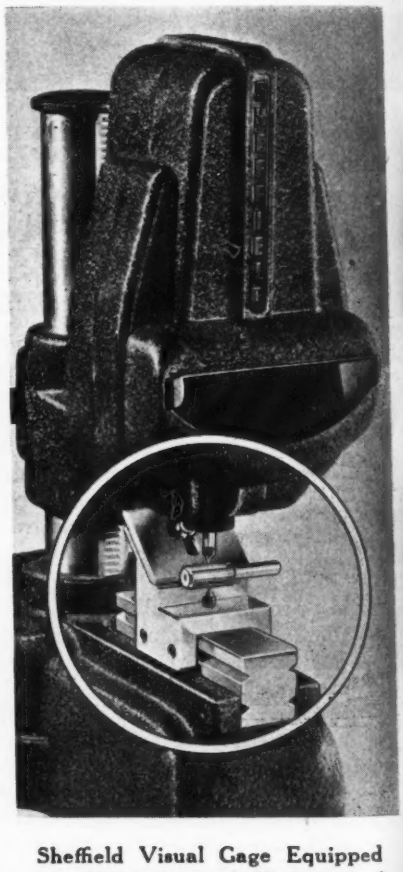
Tomkins-Johnson Riveting Machine

Three operations are performed at one stroke of the ram with an electrically driven "Rivitor" recently brought out by the Tomkins-Johnson Co., Jackson, Mich. This machine is especially adapted for the job of piercing, dimpling, and riveting bail ears on pails, using 1 3/4-pound tinner's rivets. The rivets are underfed by the machine, the same as on the standard underfeed Rivitor.

The unpierced pail and ear are placed over the rivet and properly located by gages. When the machine ram descends, a combination piercing and dimpling die mounted on a spring-actuated pressure pad attached to the ram forces the work over the rivet, piercing and forming a dimple in the pail and ear. The dimple is deep enough to prevent the manufactured head of the rivet from projecting inside the pail. At the end of the down stroke, the rivet set (not visible in the illustration because it is hidden by the pressure pad) forms a slightly rounded rivet head. 84

Thread Pitch Diameter Checking Attachment for Sheffield Visual Gage

A ball-point attachment for Sheffield visual gages, designed for rapid and accurate production checking of the pitch diameter of threaded parts, is being placed on



Sheffield Visual Gage Equipped for Checking Pitch Diameter of Threads

To obtain additional information on equipment described on this page, see lower part of page 188.

"Aircraft Quality" GEARS

For the products you are now manufacturing or planning to manufacture, you should know about the many advantages of Foote Bros. "aircraft quality" gears.

These gears were developed to transmit the loads of giant aircraft engines, and the essential demands of high speed, compactness and light weight required a precision in manufacture that amounted to almost theoretical perfection.

Today at Foote Bros. four large plants, these gears are being produced in amazing quantities. The facilities of these plants, plus the "know how" acquired by Foote Bros. engineers and production men, offer manufacturers a new approach to "better power transmission through better gears" for their postwar products.

A new engineering production bulletin on these "aircraft quality" gears will aid your engineers in determining how they can best be applied to your product. Write for your copy today.

FOOTE BROS. GEAR AND MACHINE CORPORATION, DEPARTMENT P
5225 So. Western Blvd., Chicago 9, Ill.

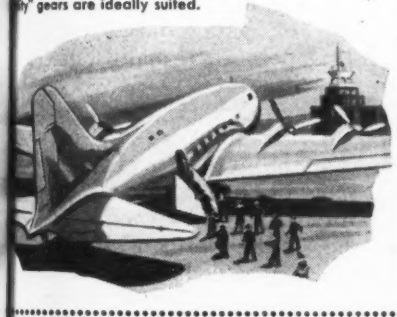
OFFER YOU THESE 5 ADVANTAGES

- ★ GREATER MECHANICAL EFFICIENCY
- ★ GREATER COMPACTNESS
- ★ HIGHER SPEED
- ★ REDUCTION IN WEIGHT
- ★ GREATER QUIETNESS

FOOTE BROS.

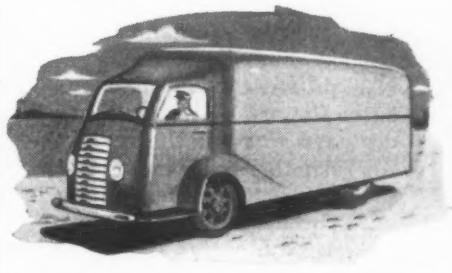
Better Power Transmission Through Better Gears

...ctuators or other devices on commercial and military planes, "aircraft ...ity" gears are ideally suited.

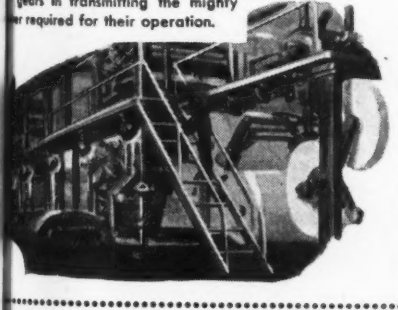


For airplane engines of every size, "aircraft quality" gears offer light weight, compact size, high speed.

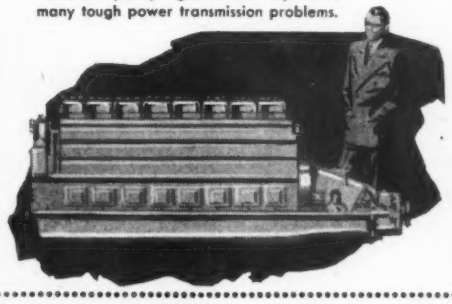
For internal combustion engines, "aircraft quality" gears transmit high speeds with a reduction of size and weight.



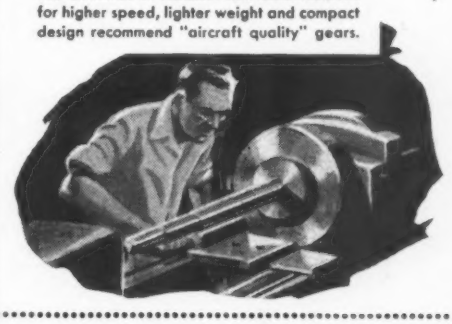
...ing presses can use "aircraft quality" gears in transmitting the mighty ...er required for their operation.



For the manufacturers of Diesel engines, "aircraft quality" gears can help solve many tough power transmission problems.

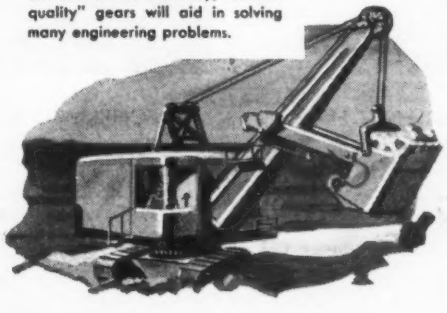


The demands of machine tool manufacturers for higher speed, lighter weight and compact design recommend "aircraft quality" gears.



...use of their ability to stand up under tough service, "aircraft quality" ...rs can aid in making tractors better

On construction machinery, "aircraft quality" gears will aid in solving many engineering problems.



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Please send me a copy of the Engineering Bulletin on "Aircraft Quality" Gears as soon as it is available.

Name.....

Position.....

Company.....

Address.....

City.....*State*.....

the market by the Sheffield Corporation, Dayton 1, Ohio. The accuracy of this equipment is said to be comparable, for practical purposes, to that of the three-wire method, but the inspection operation can be performed much quicker. The attachment can be used on both the 500-1 and 1000-1 models of the visual gage.

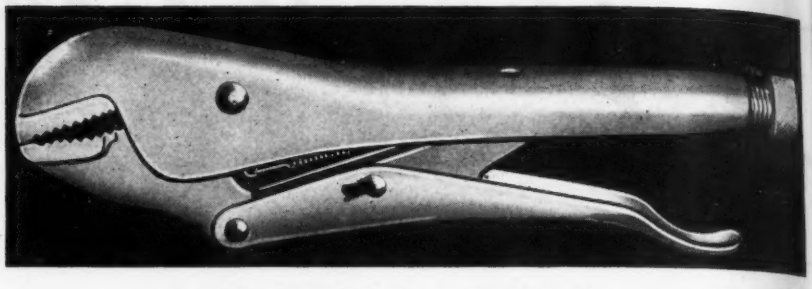
The attachment has a chromium-plated bracket and adjustable backstop with a thread-checking ball point of tungsten carbide mounted in the bracket. A second identical ball point is provided for the visual gage spindle. The gage is set by means of threaded masters instead of gage-blocks.

Three pairs of ball points equivalent to the best wire sizes (pitch line contact) for 36, 20, and 12 threads per inch are furnished as standard equipment, which can be used for checking threaded parts with from 11 to 56 threads per inch and up to 1 inch nominal size. Pairs of ball points in other sizes are available. ----------85

Norton Vitrified Bonded Diamond Wheel

A vitrified bonded diamond wheel has been developed by the Norton Co., Worcester 6, Mass., to supplement the resinoid bonded and metal bonded diamond wheels previously brought out by the company. These three types of wheels have been designed to meet the requirements for grinding all kinds of carbide tools, as well as glass, quartz crystals, porcelain, etc.

The combination of fast cutting action and extremely long life and the ability to hold a sharp corner are outstanding features of the vitrified bonded diamond wheels and of the new vitrified bonded diamond hand hone also made by this company. Another important advantage of the vitrified bonded diamond wheel is its ability to grind shank steel with little tendency to glaze or load. Both the vitrified bonded diamond hand hones and the 4- and 6-inch diameter chip-breaker wheels are now available. ----------86



Vise-wrench Made by Knu-Vise, Inc.

Improved Vise-Wrench

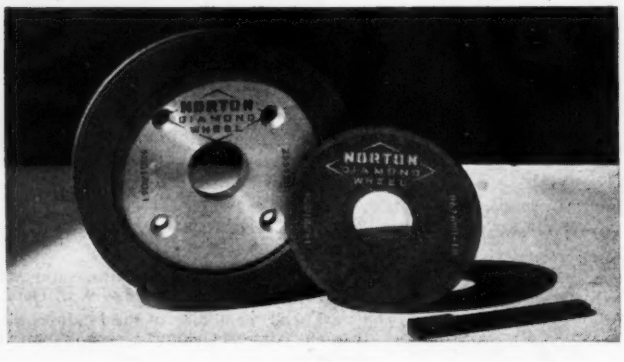
A vise-wrench of improved design has just been announced to the trade by Knu-Vise, Inc., 2208 Eighth St., Detroit 16, Mich. This wrench is made of alloy steel forgings properly heat-treated. The milled teeth welded to the stamped body are also heat-treated to resist wear. This versatile tool can be used as a portable vise to hold work for innumerable operations, including drilling, welding, riveting, soldering, grinding, or as a pipe wrench.

A feature of this wrench is the locked grip which can be maintained on the work without the aid of the hands. This arrangement permits the operator to have both hands free for handling the work. When completed, the work can be instantly released as in the case of ordinary pliers. A normal hand grip will produce a clamping pressure up to 1 ton at the jaws. These wrenches are available in two sizes: Model VG-10 in 10-inch length weighing 18 ounces, and Model VG-7 in 7-inch length weighing 13 ounces. ----------87

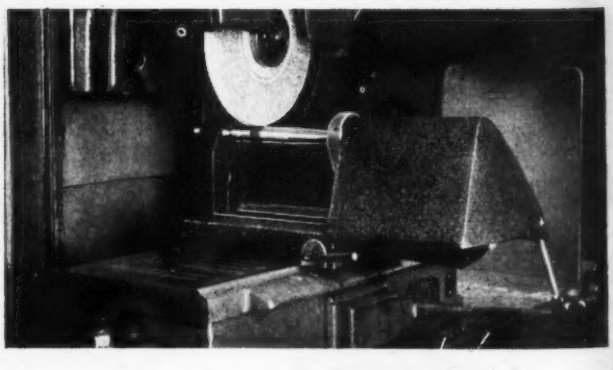
"Multi-Purpose" Grinding Attachment

An attachment designed to adapt surface grinders for cylindrical grinding operations on small parts has been brought out by the Strong Mfg. Co., 5312 Westminster Ave., Philadelphia, Pa. This simple device, known as the "Multi-Purpose" grinder attachment, can be installed on a surface grinder in a few minutes, and eliminates the necessity for using large cylindrical grinders on many small grinding jobs.

The Model No. 1 attachment shown in the illustration has a capacity of 6 inches between centers, and will take work up to 6 inches in diameter. A motor rotates the cylindrical work to be ground. The attachment can be tilted forward or backward to permit grinding tapered work. The work is set by hand to the approximate angle desired, after which a



Vitrified Bonded Diamond Wheels and Hand Hone Brought out by the Norton Co.



Cylindrical Grinding Attachment for Surface Grinders, Made by Strong Mfg. Co.

To obtain additional information on equipment described on this page, see lower part of page 188.

BONDED

Chicago

It's the new bond that gives the ultra smooth finishes you get with Chicago Grinding Wheels—

Precision finishes undreamed of before—

Finishes so accurate that you can measure them in micro inches with a Surface Analyzer.

Whatever you have to finish—metals, alloys, plastics, wood, laminates or composition materials—you can do it better with Chicago Wheels.

Chicago Wheels have kept pace with the precision requirements of our war industries, and you can use them with confidence to finish civilian goods better in double quick time.

CHICAGO GRINDING WHEELS

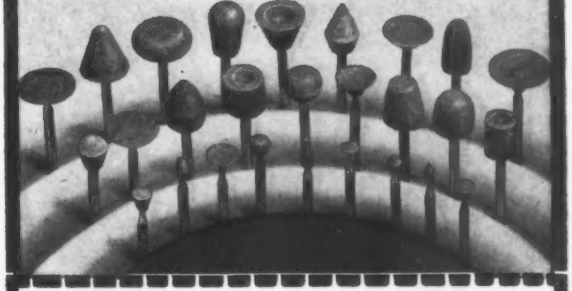
A wide range of grains and grades and—for the duration—sizes up to 3" in diameter.

CHICAGO MOUNTED WHEELS

The first made and the finest today. In a selection of bonds, abrasives and shapes to handle each job more efficiently.

TRY ONE FREE

We'll send without charge a Mounted Wheel or an FV Bond Grinding Wheel. Tell us size you'd like.



Write for Catalog listing all Chicago products and showing comparative photographs of finishes with different kinds of Wheels.

CHICAGO WHEEL & MFG. CO.

Headquarters for Mounted Wheels and Small Grinding Wheels

1101 W. Monroe St., Dept. MR, Chicago 7, Illinois

* Half a Century of Specialization has established our Reputation as the Small Wheel People of the Abrasive Industry.

Send Catalog. Interested in MR-11

☐ Mounted Wheels. ☐ Grinding Wheels.

☐ Send Test Wheel. Size.....

Name.....

Address.....

precision vernier adjustment is used to obtain the exact angular setting. Provisions for tilting the work in either direction permit grinding angular surfaces which slope in two directions.

The attachment is adapted for experimental work, as well as for regular production service. It can be employed for the shoulder-grinding of cylindrical parts and for grinding circular forming tools, plug gages, reamers, counterbores, or, in fact, any cylindrical grinding of either straight or angular work within its range. The precision indexing fixture provides for grinding flat, square, hexagonal, rectangular, and octagonal work. This feature is particularly useful in making broaches and grinding relief on taps and reamers. The Model No. 2 attachment has a capacity of 10 inches between centers, and will handle work 8 inches in diameter. 88

Barnes Rotary Pump

A new low-pressure rotary pump designed for industrial application which affords an efficient, economical method for pumping all types of liquids having lubricating qualities has been announced to the trade by the John S. Barnes Corporation, Rockford, Ill. This pump is adapted for use as a lubricating booster pump for oil lines, a gasoline-dispensing pump, and for oil-pressure systems on automotive equipment. It has also proved especially well suited for use on torque convertors. The capacity of the pump ranges from 1 gallon per minute at 600 R.P.M. to 4 gallons at 2400 R.P.M. It has a high volumetric efficiency and will handle fluids of extremely low viscosity.

An outstanding feature is the Barnes patented spur-gear tooth form designed to eliminate excessive sliding and to reduce slippage of the fluid to the minimum. Each tooth completely fills the mating space as the gears mesh to effect an efficient seal. Positive displacement of the fluid is thus assured, regardless of variations in fluid viscosity or other factors. Protection against excessive pressures is afforded by a relief valve adjusted and set at the factory.

The driving gear is equipped with a free floating type drive-shaft provided with a shear pin to minimize damage caused by foreign materials which may accidentally enter the pump housing. A spring-loaded oil seal is used on the drive-shaft. The pump is self-priming, and all moving parts are self-lubricated. The maximum pressure range is 200 pounds per square inch, and tests show that a vacuum up to 26 inches of mercury can be obtained. The pump occupies only a small space, and weighs 3 1/2 pounds. 89

Assembled and Disassembled Views of Rotary Pump Brought out by the John S. Barnes Corporation

Federal Dial Indicator Snap Gage with Retractable Anvil

Federal Dial Indicator Snap Gage

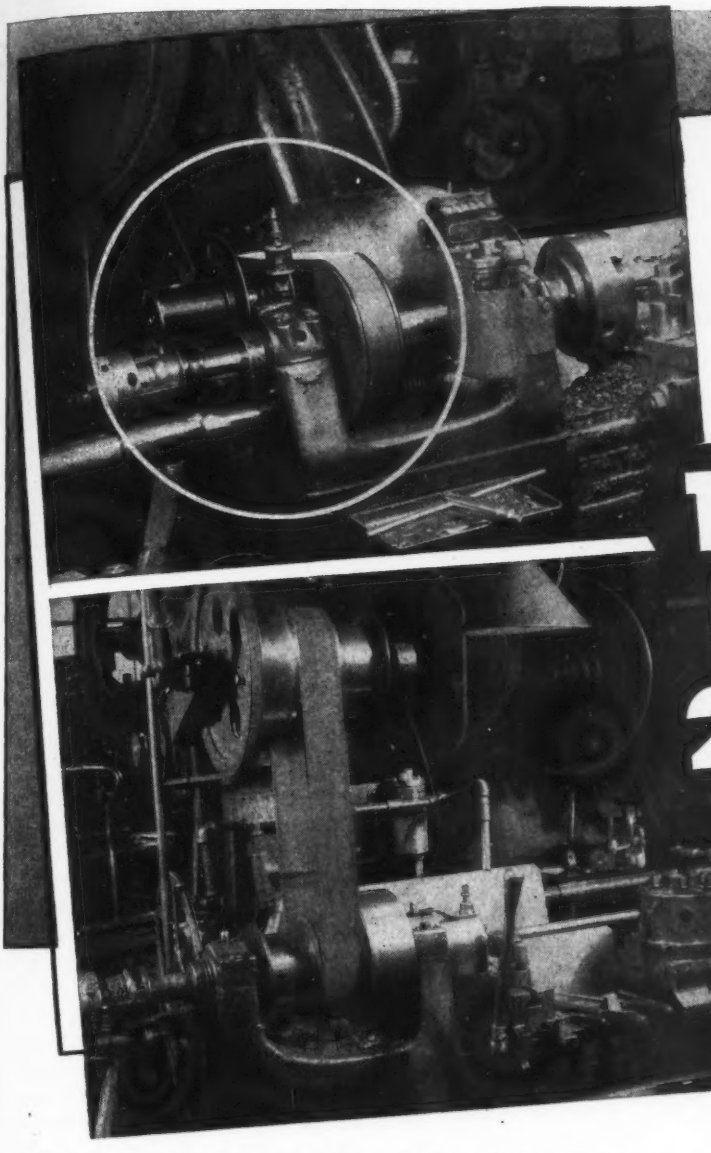
An indicator snap gage with retractable anvil, which is adjustable for size and has no lost motion, has been brought out by the Federal Products Corporation, 1144 Eddy St., Providence 1, R. I. This visual dial indicator snap gage is known as Model 1330 P-100. The retractable anvil feature makes the gage easier to apply and lessens the danger of marring the surface of highly finished work. It is adjustable to any dimension within 1 inch, and can be locked securely.

The movement of the sensitive contact point is transmitted directly to the dial indicator. Readings are to 0.0001 inch. The gage is 5/8 inch thick, 6 inches long, and weighs only 15 ounces. The contact points are made of Norbide to insure long service. 90

Nicholson "Super-Shear" File

The Nicholson File Co., Providence, R. I., has developed an entirely new type of milled curved-tooth file called the "Super-Shear," which combines the functions of fast stock removal and smooth finishing. Instead of the curved teeth of the conventional milled-tooth file, which are cut in arcs generated by centers located along the axis of the file, the arcs for generating the "Super-Shear" teeth are located

To obtain additional information on equipment described on this page, see lower part of page 188.



Case History OF TWO MACHINES

1 with REEVES SPEED CONTROL

2 without SPEED CONTROL

Here are two hand screw machines, both doing the same types of work—yet one is much more versatile, much more capable of accurate, speedy production than the other. One is equipped with a compact REEVES Vari-Speed Motor Pulley, permitting operation at any speed desired—at turn of handwheel, to meet requirements of different kinds and sizes of stock, different operations, etc. With the other the turning speed is *fixed* at a definite number of revolutions per minute—changeable only, *in steps*, by shifting belt from one pair of pulleys to another.

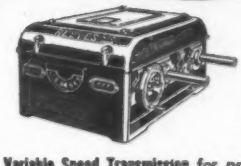
The second machine was later equipped with a REEVES Vari-Speed Motor Pulley for complete flexibility.

The advantages of REEVES Variable Speed Control, on all types of production machines, are universally recognized. Not so well known, however, is the ease and facility with which standard REEVES units can be installed on machines in service. Since these units are made in many sizes of three different designs there is usually no difficulty in selecting and installing the correct unit, at minimum cost, and with a minimum requirement of time.

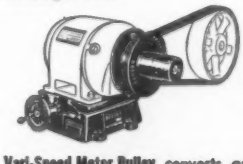
There's a REEVES Speed Control engineer near you, to help solve your installation problem. Write us.

REEVES PULLEY COMPANY • Dept. M • **COLUMBUS, INDIANA**

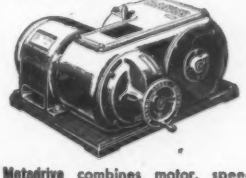
The 3 Basic Units in the REEVES LINE



Variable Speed Transmission for providing infinite, accurate speed flexibility over wide range. Send for Catalog T-443.



Vari-Speed Motor Pulley converts any standard constant speed motor to a variable speed drive. Send for Catalog V-440.



Motodrive combines motor, speed varying mechanism and reduction gears in single compact unit. Send for Catalog M-441.

REEVES *Accurate Variable* **Speed Control**

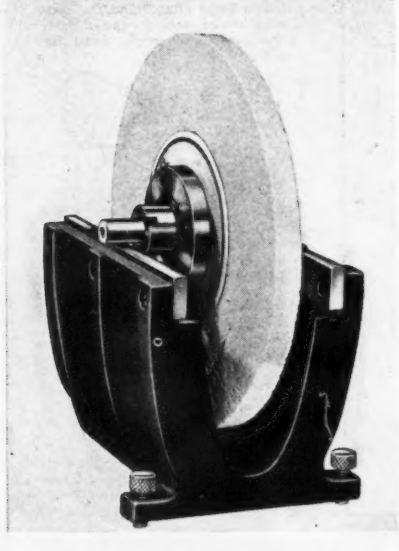
off center in relation to the axis. Thus the leading ends of the teeth have wide gullets with the right angle for fast cutting, and the teeth become shorter in height and spaced closer together as they terminate in a long shearing angle, which produces the desired finish-shearing effect.

When a surface is filed with a right-to-left shearing stroke in the conventional manner, the new file smooths out the rough surface left by the leading roughing portions of the file teeth. With this type of teeth, the file practically takes the place of a roughing and a finishing file. Longitudinal serrations in the teeth serve to break up the filings and assist in clearing the teeth of chips. The serrations also prevent chatter and serve to keep the file from running off the intended line of travel.

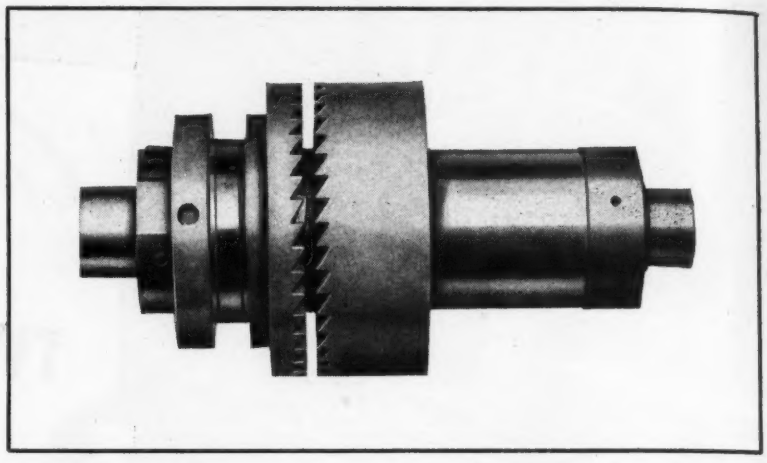
The new file is designed for use on flat and convex surfaces of aluminum, brass, babbitt, bronze, copper, magnesium, cast iron, and soft metal alloys, as well as plastics, hard rubber, and hard wood. It is made in lengths of 8, 10, 12, and 14 inches. 91

Balancing Stand for Surface Grinding Wheels

A balancing stand for surface grinding wheels has been brought out by the Taft-Peirce Mfg. Co., Woonsocket, R. I., which consists of a cast-iron base on which two hardened rails are mounted, as shown in the illustration. The balancing arbor rolls freely on the hardened rails when testing the balance of a mounted wheel. Surface grinding wheels up to 7 inches in diameter can be accommodated on this stand. 92



Taft-Peirce Balancing Stand for Surface Grinding Wheels



Rockford Multiple-disk and Jaw Type Clutch

Reimuller "Hy-Speed" Precision Punch Press

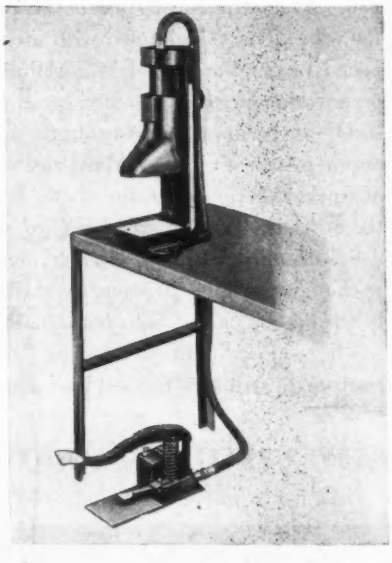
A new high-speed punch press, which can be used as a pipe vise, a tensile or compression testing machine, or a shear for plate or round stock, has been added to the line of Reimuller Brothers Co., 9400 Belmont Ave., Franklin Park, Ill. This is a precision bench press, of semi-steel construction, in which the features of the V-way vise and gap style press made by this company have been combined. The V-ways of the press eliminate the necessity for using die shoes and provide for more speedy and efficient handling of many production jobs.

The new punch press is made in a 5-ton size, and has a 5- by 6-inch platen and a ram movement of 7 inches. It will shear 1/4-inch plate or 1/2-inch round stock, and has a capacity for holding work, when used as a pipe vise, up to 6 inches in diameter.

Only two levers are used in the hydraulic foot control, which leaves the operator's hands free for handling the work. One lever is used for applying pressure up to the rated tonnage and the other for releasing the pressure for the two-speed return movement. The press is readily portable when mounted on a stand. 93

Rockford Combination Multiple-Disk and Jaw Type Driving Clutches

A line of combination multiple-disk and jaw type driving clutches, designed especially for use in high-speed drives which require multiple-disk clutch action for starting followed by shockless positive drive, has been developed by the Rockford Drilling Machine Division, Borg-Warner Corporation, Rockford, Ill. The first movement of the shipper sleeve of this new clutch brings the driven member up to speed with a smooth powerful action. Further movement of the shipper slides the teeth of the jaw clutch into shockless engagement under no-load conditions for positive continuous driving, after which pressure on



"Hy-Speed" Precision Punch Press Made by Reimuller Brothers Co.

To obtain additional information on equipment described on this page, see lower part of page 188.

. . . help sustain high production, and precision

Kennametal centers outlast high speed steel centers 50 to 100 times, because the nib is made of special, very hard, non-galling grade of carbide. Increased production rates can thus be sustained—jobs keep turning on Kennametal centers, while steel centers are being removed for grinding many times—40, 50, or even 100.

Chatter due to center wear is eliminated and accurate machining thereby maintained. Costs are reduced—fewer centers need to be reground—less idle time of machine and operator for replacements.

The unique ability of Kennametal centers to keep work running true makes them well suited for precision jobs on grinders, and, when teamed with Kennametal lathe tools, they help to assure such accurate turning that grinding operations can often be eliminated.

Kennametal centers are stocked in standard sizes—Morse, Brown & Sharpe, and Jarno tapers. Separate, accurately molded nibs are available for those who wish to make their own centers. Catalog 44 describes them. A copy is yours for the asking.

KENNAMETAL

TRADE MARK REG. U. S. PAT. OFF.

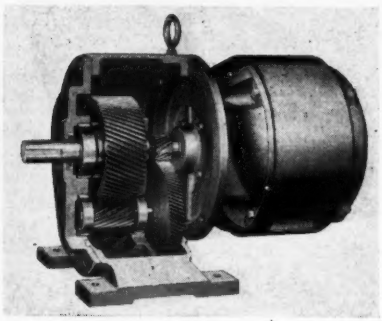
RIOR CEMENTED CARBIDES

KENNAMETAL *Inc.*, LATROBE, PA.

the disk is released. This arrangement permits fast, easy, and reliable operation. The clutch can be easily installed and is simple to adjust. It is made in capacities ranging from 2 to 25 H.P. at 500 R.P.M. 94

Cullman Speed Reducer

The Cullman Wheel Co., 1344 Altgeld St., Chicago 14, Ill., has added a new type speed reducer to its line of machine tool driving equipment. This new speed reducer is made in a range of sizes from 1/2 to 10 H.P., and driving ratios up to 5 to 1 on the single type and 20 to 1 on the double type are obtainable. An unusually large selection of speeds is made available when using a 1200- or 1800-R.P.M. motor. These streamline compact units have helical pinions and gears supported on ball bearings. They are designed to take a liberal overload and are totally enclosed in an oil-tight housing. 95

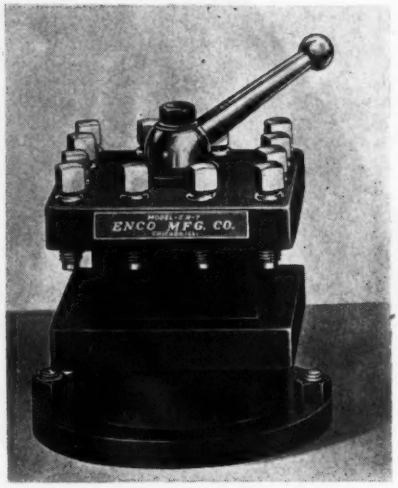


Speed Reducer Made by the Cullman Wheel Co.

Enco Turret Toolpost

The Enco Mfg. Co., Department 89, 4522-24 Fullerton Ave., Chicago 39, Ill., has brought out a Model CR compound turret toolpost which is designed especially for use on engine and bench lathes with low center heights (low height from the top of the compound rest to the center line of the spindle). This toolpost is made in sizes covering a range of lathe swings from 9 to 36 inches.

The turret block has twelve indexing positions, spaced 30 degrees apart. This arrangement permits each of the four tools mounted in the block to perform more than one operation. A facing tool, for example, can be used for turning by indexing it to the next position. This makes it possible to use standard ground tools, including angular tools, without regrinding. 96

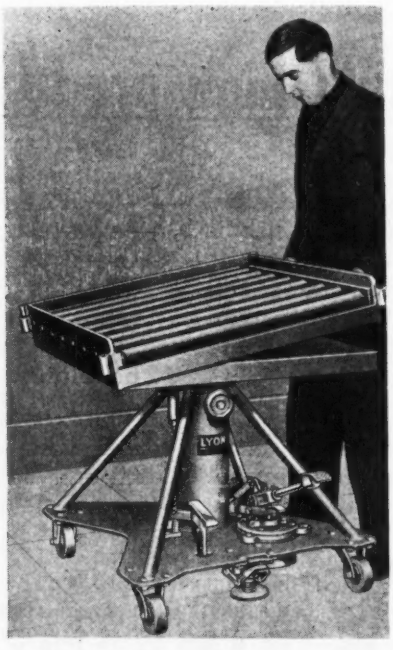


Enco Turret Toolpost for Engine and Bench Lathes

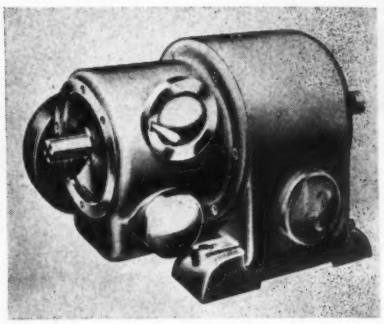
Roller Top for Lyon-Raymond Hydraulic Elevating Tables

The Lyon-Raymond Corporation, 1778 Madison St., Greene, N. Y., is now offering as an optional feature for its hydraulic elevating table a removable and reversible roller top. This top is designed to increase the versatility of the elevating table, and may be supplied with new tables or obtained for tables already in use. Instant installation or removal of the roller table is possible, since the framework simply fits down over the permanent top, eliminating the necessity for bolts or other fasteners.

The roller top consists of a rigid welded framework supporting ball-bearing conveyor rolls. Since the table top is square, it can be placed on the table in any position required for conveying work from front to back or from side to side. A hydraulic elevating table equipped with a roller top is particularly adapted for conveyor systems requiring a change in level or direction of movement. 97



Lyon-Raymond Hydraulic Elevating Table Equipped with Roller Top



Variable-speed Drive Made by Lombard Governor Corporation

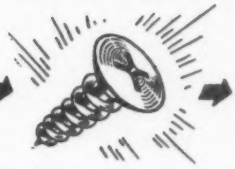
Variable-Speed Drive

A new variable-speed drive consisting of simple gearing for transmitting power and a light V-belt for varying the speed ratio has been brought out by the Lombard Governor Corporation, Ashland, Mass. Positive, highly efficient driving, coupled with light weight and small size, is a feature of this drive.

The drive is made in a wide range of sizes and speed ratios. Drives from 1 to 100 H.P. provide variable-speed ratios ranging from 1 1/4 to 1 to 70 to 1. The heat-treated precision-cut gearing operates noiselessly in an oil bath. The concentric output and input shafts are designed to facilitate installation. Although normally furnished with a manual-control handwheel or lever, the unit can also be obtained with remote control. 98

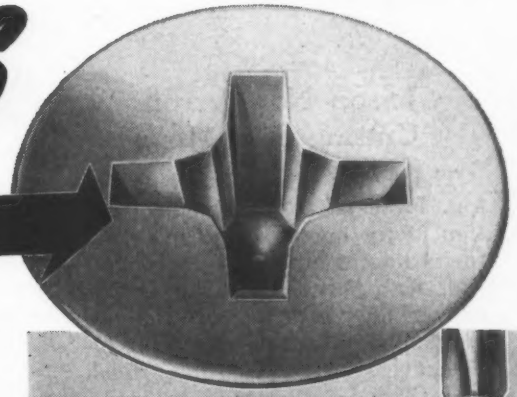
To obtain additional information on equipment described on this page, see lower part of page 188.

AS A  WEAPON FOR KNOCKING PRODUCTION COSTS  DOWN

IT'S HARD TO MATCH THIS--> 

THE SCREW WITH THE ENGINEERED RECESS THAT STEPS UP  SCREW DRIVING SPEED AS MUCH AS 50%

--->IT'S PHILLIPS



THE ENGINEERED RECESS

Right at your command is one of the most potent and efficient weapons for speeding up assembly and cutting costs that you could hope to find.

It's Phillip's – the Engineered Recessed Head for all kinds of screws.

It's the screw recess that eliminates fumbling, wobbly starts, slant driving, and dangerous skids – the troubles that have long made screw driving slow, awkward – and costly!

It's the screw recess that makes driving easier for workers – helps keep them going at top speed through a full shift.

It's the screw recess that lets you adopt spiral and power driving for assemblies where speed tools have never been practical.

Hundreds of plants have increased screw-driving speeds as much as 50% . . . and cut costs correspondingly . . . simply by switching to Phillips Recessed Head Screws. Can you do the same? Make the switch to Phillips Screws now – and you'll see. You'll see they cost *less* because they help you produce much *more!*

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

TO MAKE WARTIME QUOTAS AND PEACETIME PROFITS

Faster Starting: Driver point automatically centers in the Phillips Recess . . . fits snugly. Fumbling, wobbly starts, slant driving are eliminated. Work is made trouble-proof for green hands.

Faster Driving: Spiral and power driving are made practical. Driver won't slip from recess to spoil material or injure worker. (Average time saving is 50%.)

Easier Driving: Turning power is fully utilized. Workers maintain speed without tiring.

Better Fastening: Screws are set-up uniformly tight, without burring or breaking of screw heads. The job is stronger, and the ornamental recess adds to appearance.

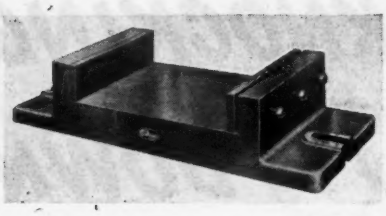
IDENTIFY IT!

Center corners of Phillips Recess are rounded . . . NOT square.

Bottom of Phillips Recess is nearly flat . . . NOT tapered to sharp point.

24 SOURCES

American Screw Co., Providence, R. I.
Atlantic Screw Works, Hartford, Conn.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Manufacturers Screw Products, Chicago, Ill.
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
Wolverine Bolt Co., Detroit, Mich.



Challenge Work- and Tool-holding Fixture

Work- and Tool-Holding Fixture

A fixture for holding work or tools for performing machining operations has recently been added to the line of precision shop equipment made by the Challenge Machinery Co., Grand Haven, Mich. The purpose of this fixture is to cut down the set-up and loading time on milling machines, boring mills, planers, shapers, and drill presses. The general construction features are shown in the accompanying illustration. The fixture is available in three sizes. 99

Jessop Non-Ferrous Cutting-Tool Metal

The Jessop Steel Co., Washington, Pa., has announced the addition of an improved cutting metal to its line of cutting-tool products. This material is a cast non-ferrous alloy made up principally of chromium, tungsten, and cobalt. It has a hardness range of 60 to 62 Rockwell C, and is designed to bridge the gap between high-speed steel and cemented-carbide cutting-tool materials.

New tools of this material are cast to shape, and except for surface grinding are used in the "as-cast" condition. They have exceptionally high red-hardness, only one point drop in Rockwell C hardness being noted at temperatures ranging as high as 1900 degrees F. In actual machine testing, this alloy tool has proved that increased feed, speed, and depth of cuts are possible on many applications for which high-speed tools are in general use. It is claimed that peak efficiency is realized when cutting at speeds 20 to 80 per cent above the top speeds ordinarily employed for high-speed tools.

This alloy cannot be hot-worked and is not susceptible to heat-treatment. It can be furnished in both flats and squares for tool-holder bits or for milling cutter inserts, surface-ground to tolerances of plus 0.000 and minus 0.005 inch. Round sections are centerless ground to the same tolerances. Die inserts or other complicated sections can be furnished in the "as-cast" condition. 100

Taft-Peirce Steel Straightedges

The Taft-Peirce Mfg. Co., Woonsocket, R. I., is now manufacturing a line of steel straightedges comprising six sizes ranging from 12 to 72 inches in length. These carefully proportioned straightedges are hardened, drawn, and accurately ground to obtain straight parallel edges. The 12-inch length straightedge is 1 inch high, 1/4 inch thick, and weighs 1 pound. The 72-inch straightedge is 4 inches high, 1/2 inch thick, and weighs 36 pounds. 101

Webb Plate-Bending Roll

The Webb Corporation, Webb City, Mo., has recently placed on the market an initial type plate-bending roll of compact design designated "R-3-L." This roll can be made in twelve different capacities for bending plate material up to 5/16 inch in thickness and up to 8 feet in length. It is furnished with the Webb totally enclosed speed reducer and automatic balance bar such as used on previous models. The bending roll illustrated has manually operated equipment for raising the rear roll, but the machine can also be furnished with a power roll raising device, if desired. 102

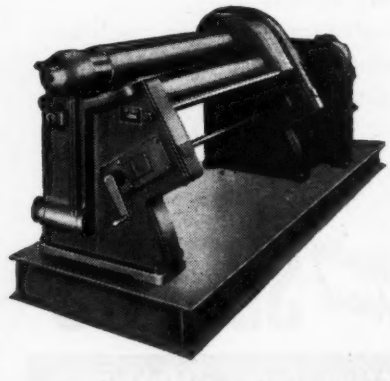


Plate-bending Roll Made by Webb Corporation

Live Center for Lathe and Grinder Tailstocks

A high degree of accuracy and the elimination of chatter are features claimed for the "Roto-Center" live center brought out by the Falls Products Co., P. O. Box 64, Milwaukee, Wis. This center is intended for use in grinder and lathe tailstocks to replace dead centers.

The spindle point is ground after being mounted in its own bearings to insure concentricity. The removal of internal play and the preloading of the bearings through a threaded retaining ring prevent chatter. Other features include the use of high-precision Timken roller bearings; a heavy-duty seal for excluding chips, dirt, and cutting oil; induction-hardened parts; and grease lubrication. 103

Steel-Plate Weight Calculator and Size Selector

A combination steel-plate weight calculator and size selector has been developed by the Lukens Steel Co., Coatesville, Pa. The device is designed to permit rapid calculation of the weight of steel plate in a wide range of gages, widths, and lengths. The calculator operates somewhat in the manner of a slide-rule, giving the weight of any steel plate from 10 to 200 inches wide and from 3/16 inch to 6 inches thick. The size selector permits the longest and widest steel plate obtainable in any desired thickness to be quickly determined. Included with this device is a table giving decimal equivalents and weights for convenience of the user. 104

"Bonoleum" Bonded Industrial Lubricants

Bonded Oil System, Inc., 1356 Commonwealth Ave., Boston 34, Mass., is introducing on the market a new line of industrial and automotive lubricants. These lubricants are blended by patented processes with the bonded ingredient "Bonoleum," and are claimed to possess superior lubricating and penetrating powers obtained by the elimination of surface tension and an inherent "active oiliness." They also have certain medicinal qualities which prevent the development of dermatitis. 105

To obtain additional information on equipment described on this page, see lower part of page 188.

LAKE ERIE
ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

LAKE ERIE Hydraulic Presses are serving America and het allies around the world. If you are in need of added Hydraulic Press capacities, you will find Lake Erie ready and able to do something about it.

LAKE ERIE ENGINEERING CORPORATION • BUFFALO 17, NEW YORK

Three-Spindle Machine Used in Boring Airplane-Engine Oil-Pump Bodies

The gear chambers and shaft holes in oil-pump bodies are bored at the plant of the Wright Aeronautical Corporation, Paterson, N. J., in the three-spindle Heald Bore-Matic here illustrated. The chambers are on opposite sides of the body, the left-hand chamber at the front being in line with the left-hand chamber at the rear, while the right-hand chambers are offset equally to the right.

The part is clamped in a fixture in the center of the machine, being located on two dowels. At the start of the automatic cycle, the fixture moves to the left, feeding into a combination drill and two-bladed carbide-tipped counterbore, which drills the shaft hole and rough-forms the right rear chamber. At the end of the stroke there is a momentary dwell, after which the fixture is fed rapidly to the right-hand side of the machine, where the part is fed into a similar tool on the rear spindle for drilling and rough-counterboring the left front chamber.

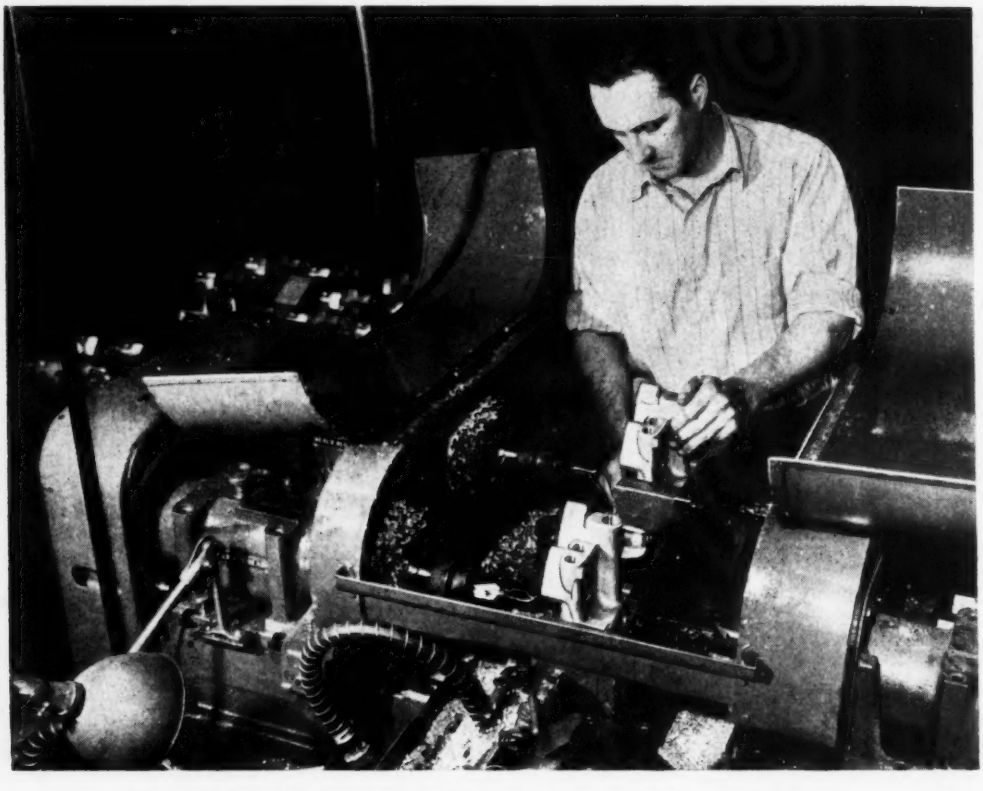
The fixture then returns to the central position on the machine and moves forward a distance equal to the distance between the right and left chambers. The cycle is then repeated for drilling and rough-counterboring the left rear and right front chambers. When the fixture again returns to the center position, the part is shifted to a second fixture, so that when the carriage next moves to the right, the third, or front, spindle will re-drill the center hole connecting the two left-hand chambers. The finishing operations are performed on a similar machine with carbide-tipped boring tools.

Repairing Broken Tools and Gages by Silver Brazing

According to Frederick L. Woodcock, chief engineer, Hamilton Standard Propeller Division, United Aircraft Corporation, many broken or worn-out tools and gages can be reconditioned and restored to usefulness by brazing with low-temperature silver brazing alloy. This alloy has a working temperature of 1175 degrees F., permitting a short heating time, and consequently causing a minimum of distortion and reduction in the hardness of the tool. The alloy is free-flowing, and capillary action carries it into every part of the joint area. Minimum joint clearances are the best; the thinner the film, the stronger the joint.

The broken tool is set in a fixture devised to suit the job. Cleaning can be done mechanically by abrasives or chemically, with carbon tetrachloride, for example. Proper fluxing keeps the brazed area clean, dissolves the oxides, reduces the surface tension of the silver brazing alloy, and makes it free-flowing, so that it can penetrate to all parts of the joint. The silver brazing alloy can be applied by hand-feeding the brazing wire, by pre-placing a sheet or strip of the brazing alloy between the parts to be brazed, or by pre-tinning the joint surfaces with the silver alloy.

The heating can be done with the oxy-acetylene gas torch, in a muffle furnace, in an induction furnace, or by dipping in a molten salt bath. By these methods, all types of tools can be repaired.



Three-spindle Machine Employed for Boring Operations on Four Gear Chambers and Shaft Holes of Oil-pump Bodies

RAISES TOOL LIFE *5 Times!*

SUNICUT

increased tool life from 75 to 380 pieces per grind

When maximum tool life on an automatic machining operation is raised from 75 pieces to 380 pieces — simply by changing the cutting oil — it's a story every production man interested in saving time, money or material wants to hear. Well, here it is!

Output was 30 to 75 pieces per tool grind, and there was a high rate of drill breakage. Time and manpower lost in changing and regrinding tools limited production . . . and to add to their troubles, finish of parts was poor.

Sun Oil Engineers heard of the problem and offered help. After studying the operating conditions, they recommended a change in cutting oils to Sunicut. The shop foreman agreed to a 3-months' trial.

Now 380 pieces per grind is their average tool life — an increase of 305 pieces! Finish is greatly improved . . . and production is up.

Sunicut . . . a clear transparent sulphurized cutting oil . . . has high heat-absorbing and metal-wetting qualities . . . making possible maximum tool life, nth degree accuracy and fine finish.

Ask a Sun Cutting Oil Engineer how Sunicut's advantages can be applied to your own shop. Write today to . . .

SUN OIL COMPANY • Philadelphia 3, Pa.

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SUNOCO **SUN INDUSTRIAL PRODUCTS**

HELPING INDUSTRY HELP AMERICA

News of the Industry

Canada

ROBERT CROOKS STANLEY, chairman and president of the International Nickel Co. of Canada, Ltd., was awarded the American Society for Metals medal for the advancement of research during the annual dinner of the society Thursday evening, October 19, at Cleveland, Ohio. He received the 1944 research medal because of his pioneering leadership in the field of metals research. MR. STANLEY became assistant superintendent of the American Nickel Works at Camden, N. J., in 1902, and was later made superintendent. In 1912, he became general superintendent of the International Nickel Co.; in 1918, he was elected vice-president in charge of operations; and in 1922, he was made president.

California

JAMES MCCLURE has been appointed public relations representative for the Pacific region of the Allis-Chalmers Mfg. Co., Milwaukee, Wis. His headquarters will be in San Francisco, Calif.

Georgia and Texas

WILLIAM J. VAN VLECK has been appointed manager of the Atlanta office of the Worthington Pump and Machinery Corporation, Harrison, N. J., succeeding EDWARD STAUVERMAN, who, after many years of association with the corporation, has resigned to engage in another line of business.

HARRY M. DUNN has been appointed sales and service representative for the Eclipse Counterbore Co., Detroit, Mich., in the south Texas territory. Mr. Dunn's office is located in the Universal Terminal Warehouse, 1006 Washington Ave., Houston, Tex.

Illinois

BROOKS EQUIPMENT CORPORATION, 90 West St., New York 6, N. Y., manufacturer and designer of shaft joints, accessories, and complete assemblies for hand-operated remote controls, announces the opening of a Chicago office, at 1 N. LaSalle St. The new office will be under the direction of JAMES K. GRINDLE, formerly sales engineer for the General Electric Co. in Chicago.

UNIVERSAL WHEEL & ABRASIVE CORPORATION, Chicago, Ill., has purchased the site for a new plant at 400 N. Ashland Ave., and started construction. It is expected that the plant will be ready for occupancy this fall. The added facilities will enable the company to greatly increase its production and will allow for future expansion.

T. L. KNECHT has been appointed vice-president and general manager of Borg & Beck, Chicago, Ill., a division of the Borg-Warner Corporation. He was previously factory manager, and is succeeded in that position by J. T. BRANIT, formerly superintendent of the company's pump plant.

Michigan

JOHN D. GORDON, formerly general manager of the Taylor-Winfield Corporation, and recently executive assistant to the president of the Federal Machine & Welder Co., Warren, Ohio, has joined the Progressive Welder Co., 3050 E. Outer Drive, Detroit 12, Mich., in the capacity of general sales manager. K. SWANSON, previously chief engineer of the Federal Machine & Welder Co., has also joined the Progressive Welder Co., in the capacity of chief engineer, and W. KAISER, formerly development engineer with the National Welder Co., will assist in development and application engineering on the new battery welder line of the Progressive Welder Co.

CARBOLOY COMPANY, INC., announces that the extra-performance dies specifically designed for the drawing of fine steel wire of approximately 0.015-inch diameter and under (designated R-1 dies in the Carboloy catalogue) and made from Grade 999 cemented carbide, are now being carried as stock items at the plant of the Carboloy Company, Inc., Detroit 32, Mich.

H. M. CHERRY has been made general manager of the George L. Nankervis Co., Detroit, Mich., manufacturer of plating equipment. Mr. Cherry is a graduate chemical engineer of the University of Michigan, class of 1918. For the last five years, he has been equipment engineer with the A. T. Wagner Co., Detroit.

ARTHUR G. NEUBAUER has been promoted to the position of sales manager in charge of jobbing sales for the Mid-West Abrasive Co., Detroit, Mich. Before joining the company four years ago, Mr. Neubauer was connected with the jobbing divisions of the AC Spark Plug Co. and the McAleer Mfg. Co.

E. L. ESSLEY MACHINERY CO., Chicago 22, Ill., has opened a branch office at 607 Keeler Bldg., Grand Rapids, Mich., with HARRY J. SWANSON in charge. Mr. Swanson has been covering the western Michigan and northern Indiana territory for some years.

EMPIRE TOOL CO., Detroit, Mich., has been appointed exclusive distributor of the live centers made by Aeronautical Products, Inc., Detroit, Mich., and Washington Court House, Ohio.

UDYLITE CORPORATION, 1651 E. Grand Blvd., Detroit 11, Mich., is celebrating this month the completion of twenty-five years of activity in the field of metal finishing.

New England

LOGANSPORT MACHINE CO., INC., Logansport, Ind., has appointed the RUDEL MACHINERY CO., INC., of Boston, exclusive sales representative for the Logan line of air and hydraulic equipment in the New England territory. The Rudel Machinery Co. also represents the Logansport Machine Co., Inc., in the New York territory, and the Rudel Machinery Co., Ltd., represents the company in Canada.

RALPH WOODWARD has joined the staff of the B. C. Ames Co., Waltham, Mass., maker of dial indicators, gages, comparators, and bench type lathes, millers, and shapers, as sales engineer. He has been identified with machine tool manufacture in New England for twenty years, and comes to his new position from the Norton Co., Worcester, Mass.

GENERAL ELECTRIC CO., Pittsfield, Mass., announces that it has purchased a twelve-acre plot in Anaheim, Calif., on which it is planned to erect a post-war manufacturing plant for making plastic parts for airplanes.

JOHN E. LOVELY, vice-president of the Jones & Lamson Machine Co., Springfield, Vt., has been elected a vice-president of the American Society of Mechanical Engineers, to serve a two-year term beginning with the Society's annual meeting during the last week of November.

HARRY F. STANFORD has joined the executive staff of the Narragansett Machine Co., Pawtucket, R. I. He was previously connected with SKF Industries of Philadelphia, and prior to that was production control manager with the Bendix Aviation Corporation.

EXPERIENCE CAPTURED IN STEEL

Watchmakers once were considered the ultimate in skilled mechanics. Their precision was the result of years of training, unusual deftness of hand, and powerful magnifying lenses. Today, in hundreds of machine shops all over America, men produce parts as small and as accurate as any watch parts and produce these parts in great quantity to uniform accuracy

Uniform, mass production of high precision parts is made possible by the use of simple yet extremely precise small hand gages. **VARD** makes these gages and carries in stock, ready for shipment on order, numbers of gage members and handles in thread sizes from 0-80 NF to 1½ in. NC. Cylindrical gages are always made to order. Tapered pipe thread plug gages in sizes of 1/16 in. to 2 in. inside pipe diameter are carried in stock. Pipe gages comply with specification AN-GGG-P-363.

VARD manufactures all types of thread, cylindrical and taper gages. We produce gages to your order in National, Acme, Metric, Lowenherz, British Association or in special modified thread forms.

D manufactures high precision cylindrical s, using the finest production machinery optical testing equipment

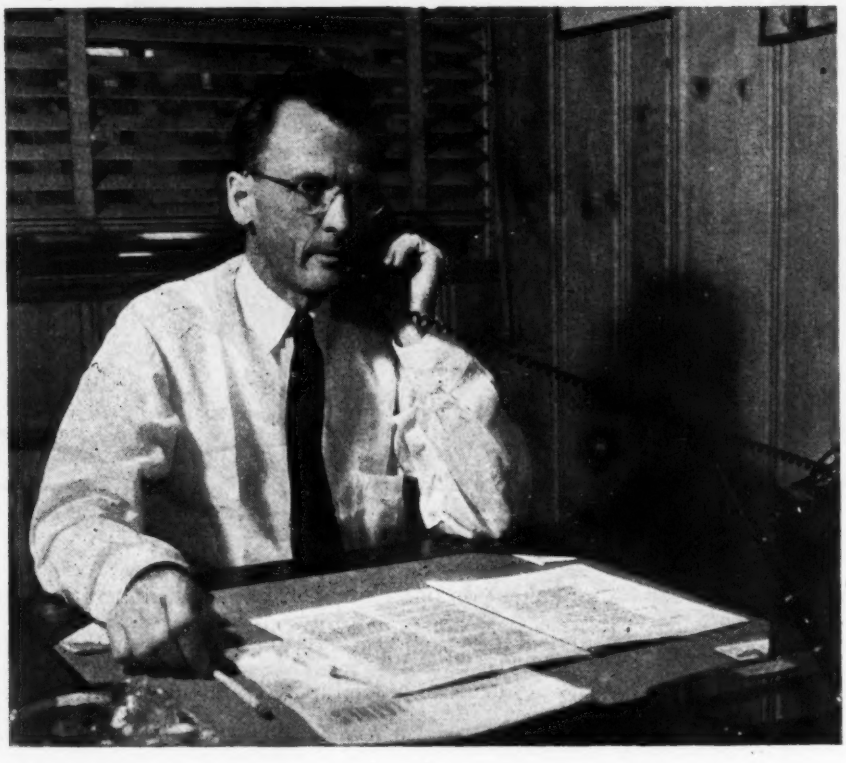
VARD threaded plug gages, especially in very fine thread sizes, are recognized throughout industry for their accuracy

VARD pipe thread and taper gages all conform to aircraft spec fication AN-GGG-P-363. Small diameter pipe gages require t utmost skill in manufacture

ARD stands for Verity · Accuracy · Responsibility · Durability

VARD INC.
PASADENA 8, CALIFORNIA

RICHARD F. MOORE, president of the Moore Special Tool Co., Inc., Bridgeport, Conn., was elected president of the National Tool & Die Manufacturers Association at its annual meeting in Cleveland on September 22 and 23. Mr. Moore succeeds L. A. Sommer, president of the Sommer & Adams Co. of Cleveland, Ohio, who was instrumental in founding the association last year. The officers elected are vice-president, Willis G. Ehrhardt, president of the Ehrhardt Tool & Machine Co. of St. Louis; treasurer, H. F. Jahn, president of the B. Jahn Mfg. Co., New Britain, Conn.; and secretary, Ben Buerk, president of the Buerk Tool Works, Buffalo, N. Y.



Richard F. Moore, Newly Elected President of the National Tool & Die Manufacturers Association

New York and New Jersey

CHARLES A. SIMMONS, JR., vice-president of the Simmons Machine Tool Corporation, Albany, N. Y., has been appointed chairman of an industrial committee that will survey present and post-war employment possibilities in Albany industries. The appointment was made by Norton McKean, Albany, chairman of the Committee for Economic Development. The survey is being made preliminary to developing civic plans for post-war industrial expansion to assure employment for servicemen returning to civilian life. Data will be gathered from industries in the Albany area to show employment for 1940, present employment, and the number each industry expects to employ in the post-war period.

FRANCIS D. BOWMAN has been appointed director of public relations for the Carborundum Co., Niagara Falls, N. Y. For many years Mr. Bowman has held the title of advertising manager of the company. The advertising department has now been consolidated with the merchandising department, and M. S. IREYS, director of merchandising, has charge of all industrial advertising, with Mr. Bowman continuing to direct the company's advertising in national mediums.

WILLIAM M. KAUFFMANN has been appointed assistant to the chief engineer in charge of Diesel engine development for Mack Trucks, Inc., Empire State Bldg., New York City. He was previously assistant chief engineer of the engine research and development division of the Worthington Pump & Machinery Corporation, Buffalo, N. Y., and chief development engineer of the National Transit Pump and Machine Corporation, Oil City, Pa.

JOHN W. SANDS, who has been with the Conservation Division of the War Production Board, Washington, D. C., since January, 1942, has resumed his duties with the Development and Research Division of the International Nickel Co., Inc., 67 Wall St., New York City.

DEVENCO INCORPORATED has been organized at 150 Broadway, New York 7, N. Y., for the purpose of rendering development engineering services to industry. The new concern is headed by THEODORE J. KAUFFELD, J. Q. A. HOLLOWAY, and JAMES J. RYAN.

C. W. CAMP, for thirty-eight years with the Crocker-Wheeler Electric Mfg. Co., specializing in application engineering, is now associated with the Worthington Pump and Machinery Corporation, Harrison, N. J., in the capacity of consulting electrical engineer. Mr. Camp replaces the late Harry Wood.

LLOYD C. SMITH has been promoted to the position of assistant domestic sales manager for the Heller Brothers Co., Newark, N. J. He was previously sales representative of the Nicholson File Co., serving the New York metropolitan area for the last seven years.

Ohio

WALTER L. SEELBACH, secretary-treasurer of Forest City Foundries Co., Cleveland, Ohio, was re-elected president of the Gray Iron Founders' Society at the sixteenth annual meeting and post-war planning conference of the Association in Cincinnati October 10-11. Widely known for his activity in the interests of the gray-iron castings industry, he was one of the organizers of the trade group and served as its first president in 1928.

J. P. JOHNSON, vice-president of the Aro Equipment Corporation, Bryan, Ohio, manufacturer of pneumatic tools, aircraft products, and lubricating equipment, has been elected executive vice-president, and J. E. ALLEN, assistant to the president, has been elected vice-president. Mr. Johnson is in charge of the corporation's Cleveland plant.

PETER ROBERTSON, assistant chief industrial engineer for the Republic Steel Corporation, Cleveland, Ohio, has been appointed works manager of the Youngstown plant of the Truscon Steel Co., a Republic subsidiary, succeeding W. M. KELLEY, newly appointed assistant to the vice-president in charge of operations of the corporation.

GLENN W. SHETLER has been appointed vice-president in charge of operations of the Barium Steel Corporation, Canton, Ohio. He was previously general manager of the corporation, and prior to that was connected with the Crucible Steel Corporation's Halcomb Works in Syracuse, N. Y.

READY—IN 17 SECONDS

REPRODUCTIONS OF YOUR DRAFTSMEN'S DRAWINGS, TYPED MATERIAL, OFFICE FORMS

In this case, the operator is feeding a draftsman's pencil drawing, size 17" x 22", and a piece of sensitized paper into the machine. Smooth-running conveyor belts speed both materials around the printing cylinder . . . after which the drawing is automatically released, and the exposed paper goes up and across the dry-developing tank.

Here comes the Ozalid print . . . an exact duplicate—not a negative, of the original. You'll find it dry, ready for immediate use. And there's a very unique reason for the short time required—only 17 seconds . . . and for the fact that the print has black, or red, or blue lines on a white background—whichever color was desired.

WHY YOU MAKE PRINTS WITH THIS SPEED AND VERSATILITY

THE ANSWER is in OZALID DRY DEVELOPMENT . . . and what it has allowed designers and chemists to do.

Since only one developing operation is employed, the design of an Ozalid machine is extremely simplified. *So* compact in size you can install it in a corner of the drafting room or office. *So* easy to understand that any inexperienced person can quickly learn to turn out prints with maximum efficiency—using cut sheets or roll stock.

Also consider the amazing line of sensitized materials which react only to the *dry* principle . . . and offer this choice whenever you want to reproduce anything drawn, typed, printed, or photographed on translucent material:

• **Black, Red, Blue Line** standard papers which allow you to assign identifying colors to prints of different departments, to distinguish checked from unchecked prints, etc.

• **Transparent Papers, Cloths, Foils** which you use to produce Intermediate Originals and Composite Prints or to reclaim worn or soiled drawings.

• **Opaque Cloths** which give you prints of exceptional durability.

• ***NEW* Dryphoto Papers** which produce beautiful reproductions with all the halftone details, from photographic film-positives or perspective drawings.

See all of these Ozalid Prints yourself—and learn the complete story.

Write for "Simplified Printmaking" today.

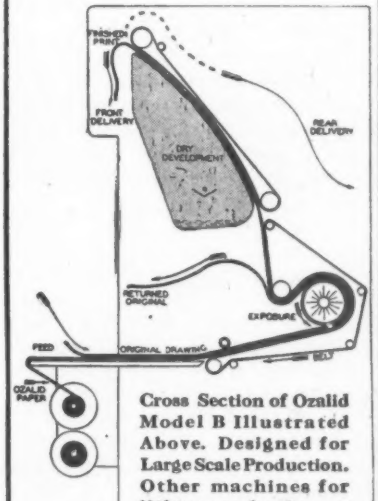
ARMY E NAVY

OZALID

Division of
General Aniline and Film Corporation

Johnson City, New York

Ozalid in Canada—
Hughes-Owens Co., Ltd., Montreal



Cross Section of Ozalid Model B Illustrated Above. Designed for Large Scale Production. Other machines for lighter production or for use with blueprint equipment. Same *dry* principle, same advantages.

Richard E. Le Blond, Newly Elected Member of Executive Committee, Machinery and Allied Products Institute

RICHARD E. LEBLOND, president of the R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio, has been elected a member of the executive committee of the Machinery and Allied Products Institute, Washington, D. C.

A. F. SPRANKLE has been appointed metallurgical engineer of the Timken Steel and Tube Division, Timken Roller Bearing Co., Canton 6, Ohio. He was formerly manager of the Alloy Bureau of the Carnegie-Illinois Steel Corporation in the Pittsburgh district.

GORDON LEFEBVRE, president of the Cooper-Bessemer Corporation, Mount Vernon, Ohio, and Grove City, Pa., has been elected a member of the executive committee of the Machinery and Allied Products Institute.

BATTELLE MEMORIAL INSTITUTE, Columbus, Ohio, devoted to industrial and scientific research, has been presented with the Ordnance Distinguished Service Award by the War Department.

Pennsylvania

DR. EDGAR S. ROSS has completed his assignment as chief of the Lubricants Section, Aviation Division, Petroleum Administration for War, Washington, D. C., after serving for a period of fifteen months. Prior to this assignment, Dr. Ross was assistant manager in charge of specialties of the Development Division, Sun Oil Co., Marcus Hook, Pa. He has now returned to the Sun Oil Co. at Philadelphia, Pa., and will devote his time to the development of technical sales in the industrial products department.

DAVE W. CHOATE has been named industrial manager at Atlanta, Ga., for the Minneapolis-Honeywell Regulator Co. and its precision industrial instrument division, the Brown Instrument Co., Philadelphia, Pa. Mr. Choate started with the Brown Instrument Co. in 1936, and has been in charge of the Milwaukee branch of that company's activities. W. S. ROBARDS takes Mr. Choate's place as head of the Milwaukee branch of the Brown Instrument Co. He has been with the company for eight years.

FIRTH-STERLING STEEL CO., McKeesport, Pa., announces five new appointments to the company's executive staff: J. P. LARKIN is chief metallurgical and sales engineer of the Steel Division; ANDREW H. GODFREY has been made assistant manager of the Firthite Division, and ANTHONY J. ALLEN, assistant manager of the Firthaloy Division; THOMAS W. GABRIEL has been appointed Ohio district sales manager, and LLOYD W. CLOWES, Pittsburgh district sales manager.

Lexington, N.Y.C.

J. P. Larkin, Chief Metallurgical and Sales Engineer, Steel Division, Firth-Sterling Steel Co.

WILLIAM S. WILBRAHAM, who since 1943 has been manager of costs and more recently assistant to the general manager of Lukenweld, Inc., a division of the Lukens Steel Co., Coatesville, Pa., has been appointed production manager. GEORGE L. SNYDER, previously chief engineer of the division, has been made assistant to the general manager, and will continue to fill his duties as chief engineer.

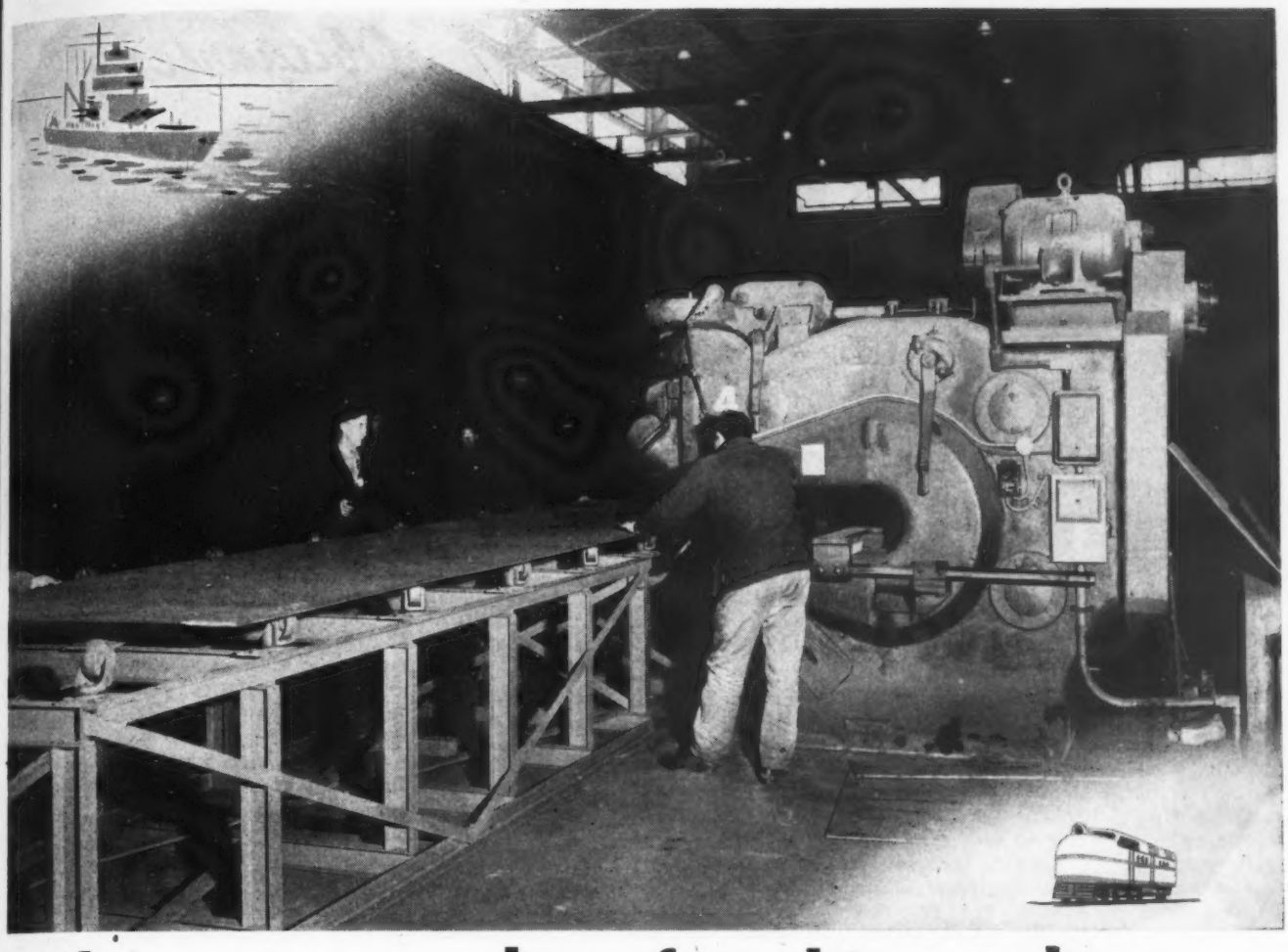
ERGOLYTE MFG. CO., 3627 N. Lawrence St., Philadelphia, Pa., has purchased

Andrew H. Godfrey, Newly Appointed Assistant Manager of the Firthite Division of Firth-Sterling Steel Co.

the equipment and inventory of the PRECISION ENGINEERING CO., 4632 Armitage St., Chicago, Ill., manufacturer of welding machines and welding equipment. WILLIAM DICKEY, former owner of the Precision Engineering Co., has become associated with the Ergolyte Mfg. Co.

A. W. NELSON has been appointed district sales manager of the Indianapolis office of the Allegheny Ludlum Steel Corporation, Brackenridge, Pa. He was formerly district representative in Minneapolis, Minn. R. C. PRESLEY has been transferred from the Chicago district to the Minneapolis office to take Mr. Nelson's place.

Anthony J. Allen, Assistant Manager of Firthaloy Division, Firth-Sterling Steel Co.



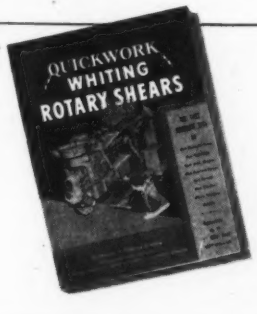
Shear armor plate for ships today—Railroad Equipment tomorrow

THERE'S NO RECONVERSION PROBLEM WITH THIS VERSATILE METAL WORKING MACHINE

Your Quickwork Shear Will

Cut straight lines
Cut narrow strips
Cut circles
Cut bevelled edges
Cut openings
Cut irregular shapes
Joggle

Make clean cuts without burrs at high speed—in a single pass



Write for bulletin.

Today, with most war production facing certain reconversion to peacetime manufacture some time in the future, a wide range of usefulness makes a machine tool doubly valuable. Quickwork shears cut parts for railroad equipment or other civilian goods as easily as they shear armor plate for a ship—users face no prospect of expensive reconversion or machinery lying idle for production changes.

Simple attachments enable you to use your Quickwork shear for a number of operations, including joggling, flanging, slitting and flattening, and cutting openings, odd shapes, and circles—all at high speeds. Investigate Quickwork Rotary Shears today; there's a model to fill every requirement.

QUICKWORK-WHITING DIVISION

WHITING CORPORATION

15673 LATHROP AVENUE, HARVEY, ILLINOIS

Herbert B. Lewis, Manager of the Machinery Division, Lukens Steel Co.

HERBERT B. LEWIS has been made manager of the Machinery Division of the Lukens Steel Co., Coatesville, Pa. Mr. Lewis, a graduate of Rennselaer Polytechnic Institute, was with the Brown & Sharpe Mfg. Co. for twenty-five years in various engineering and managerial capacities. For the last year and a half, he has been executive secretary of the Manufacturing Engineering Committee of the American Society of Mechanical Engineers, organized at the request of the War Production Board to assist in research and development relating to the war effort. He is also a past-president of the Providence Engineering Society.

FRED GROTTS, president of the Fort Pitt Steel Casting Co., McKeesport, Pa., a subsidiary of the H. K. Porter Co., Inc., Pittsburgh, Pa., has been appointed to the newly created position of director of research and metallurgy for all Porter plants. He will continue to fill the duties of his present position.

D. J. BENOLIEL, president of the Quaker Chemical Products Corporation, Conshohocken, Pa., addressed a recent meeting of the American Chemical Society in Indianapolis on the subject "Modern Laboratory Methods for Evaluating Corrosion Preventives."

CHARLES H. SLAUGHTER has been made national sales manager for the Thomas Machine Mfg. Co., Pittsburgh 23, Pa. Mr. Slaughter was previously general sales and dealer relations manager for Liberty Planers, Inc., Hamilton, Ohio.

ALLISON L. BAYLES has been elected vice-president of the American Engineering Co., Philadelphia, Pa., manufacturer of hoists, pumps, and other industrial machinery.

Washington, D. C.

H. ARTHUR DUNN has resigned from Government service to organize his own firm as business adviser on surplus war materials, with offices at 1915 Sixteenth St., N.W., Washington 9, D. C. The new concern will be known as H. ARTHUR DUNN & ASSOCIATES.

Wisconsin and Minnesota

HUGO W. LIEBERT has been appointed general works manager of the tractor plants of the Allis-Chalmers Mfg. Co., Milwaukee, Wis.; FRED S. MACKEY, general works manager of the general machinery plants; and HARRY E. LADWIG, works manager of the West Allis foundries and pattern shops.

WALTER A. MEYER, manager of dealer sales, Allis-Chalmers Mfg. Co., Milwaukee, Wis., was elected president of the Multiple V-Belt Drive Association at its recent meeting in Cleveland, Ohio.

GEORGE MAST has joined the Milwaukee Metal Spinning Co. (Spincraft), Milwaukee 14, Wis., in the capacity of engineering and production supervisor.

L. E. PHELPS has been appointed direct factory representative for the Michigan Tool Co., Detroit, Mich., with offices at 638 Baker Bldg., Minneapolis, Minn. Mr. Phelps has been a field engineer for the company in Minnesota for the last fifteen years.

* * *

DoAll Trade School Expands in New Location

The DoAll Co., 1201 Thacker St., Des Plaines, Ill., announces that the DoAll Trade School, which was organized in July, 1941, and has trained and placed over 2000 people, has moved from its former location at Minneapolis, Minn., to new and larger quarters at Des Plaines, Ill., a suburb of Chicago. The company's Customer Test and Research Laboratories are to be incorporated into the school's training program. The school is housed in a large modern plant, with three-fourths of the total training time spent in practical shop work. The course has been reduced to a four-week training period. For further information, address Director, DoAll Trade School, 254 N. Laurel Ave., Des Plaines, Ill.

Obituaries

PHILIP L. BANNAN, SR., president of the Pacific Gear and Tool Works, San Francisco, Calif., and president of the Western Gear Works, Seattle, Wash., died on October 8 in San Francisco at the age of seventy-two years. His death followed a month's illness, during which time he underwent an operation from which he did not recover.

Mr. Bannan was a pioneer gear manufacturer on the Pacific Coast. Starting as an apprentice machinist in a San Francisco machine shop, he later became owner of the plant, which still bears the name Pacific Gear and Tool Works. In 1929, in conjunction with four of his sons, he took over ownership of the Western Gear Works of Seattle. In 1937 he established the Pacific Gear Works in Los Angeles, which plant has since become a part of Western Gear Works. In 1942 the large new Western Gear Works plant at Lynwood, Calif., was built. Mr. Bannan was one of the early members of the American Gear Manufacturers Association, with which he had been affiliated since 1917. He is survived by his widow, six sons, and four daughters.

DR. CARL CLAUS, vice-president in charge of research of the Bound Brook Oil-Less Bearing Co., Bound Brook, N. J., died suddenly on October 5 at the age of sixty years. Dr. Claus had been connected with the company for twenty-three years, and was one of the first to carry on sustained research in the art of powder metallurgy, on which subject he was among the leading authorities. Dr. Claus was born in Germany, and was graduated from the University of Berlin with the degree of mechanical engineer in 1909. The following year he received the degree of doctor of engineering. He became a citizen of the United States in 1921. He was a member of the Society of Automotive Engineers and the American Society for Metals.

EARL L. MYERS, general superintendent of the Gisholt Machine Co., Madison, Wis., died at a hospital in Madison on September 20, following an eight months' illness. Mr. Myers was fifty-two years old. He became associated with the Gisholt Machine Co. in 1928 as a member of the engineering department, and during the ensuing sixteen years was successively appointed assistant to the works manager, main works superintendent, and (in 1942) general superintendent of all plants. Prior to 1928, he had been affiliated with the LeBlond Machine Tool Co. of Cincinnati. He is survived by his wife, a daughter, and a grandson.

New Books and Publications

DIAMOND TOOLS. By Paul Grodzinski. 379 pages, 5 1/2 by 8 inches. Published by Anton Smit & Co., Inc., 333 W. 52nd St., New York 19, N. Y. Price, $4.50 plus sales tax.

The purpose of this volume is to provide a short survey of the results obtained in the application of diamonds in the various technical branches of industry, with the aim of promoting economical working methods. The contents are divided into twelve chapters dealing with the following phases of the subject: Production and Qualities of Diamonds and the Diamond Trade; the Diamond as Technical Material; Diamonds and Other Precious Stones as Applied in Bearings and for Wear Resistance; the Diamond in Hardness Testing; the Truing and Dressing of Grinding Wheels with Diamonds; the Diamond as Cutting Material for Metals and Non-Metallic Substances; Machining of Glass with Diamonds; the Machining of Natural and Artificial Stone with Diamonds; Rock Drilling with Diamond Boring Crowns; Engraving with Diamond Tools; the Drawing of Fine Wires in Diamond Dies; Diamond Dust as Abrasive Material.

MECHANICAL SPRINGS. By A. M. Wahl. 435 pages, 6 by 9 inches. Published by the Penton Publishing Co., Cleveland 13, Ohio. Price, $6.

This book presents the fundamental principles underlining the design of mechanical springs, and brings together in convenient form for the designer of machines the more important developments in spring theory and testing which have taken place within recent years. Because of the importance of the helical compression or tension spring, a relatively large amount of space has been devoted to this type. Not only have the theoretical aspects of stress calculation of this type of spring been considered, but emphasis has also been laid on the fatigue properties of such springs, as well as on the fatigue problem of spring materials in general. Besides covering the helical spring, the fundamentals of design of other important spring types, including disk, Belleville, flat, leaf, torsion, spiral, volute, and ring springs have been treated. A chapter is also included on the application of rubber springs and mountings.

PRACTICAL DESIGN FOR ARC WELDING (Volume I). By Robert E. Kinkead. 8¾ by 11½ inches; 100 design plates. Published by the Hobart Brothers Co., Hobart Square, Troy 1, Ohio. Price, $3.50 per volume (complete three-volume set, $10).

This is the first of three volumes to be published on design for arc-welding in response to many requests following the publication of a number of design plates in loose-leaf form. This is not a text-book, but rather a practical working book for the welder, manufacturer, engineer, and designer who wish to take advantage of welded fabrication in present and post-war production. The book is made up of detailed drawings showing how tubing, plate, sheet, standard steel sections, angles, and bars can be used to fabricate better and stronger products by arc-welding at a substantially lower cost. Opposite each drawing is a work sheet in graph form on which notes, estimates, and sketches can be made.

HOW TO OPERATE A LATHE. By John T. Shuman and Lewis H. Bardo. 161 pages, 5 by 8 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $1.75.

This little volume presents fundamental information on the operation of the lathe. The text is arranged in question and answer form, which has proved especially effective for machine shop students. The subjects covered include The Lathe and Its Parts; Preparing the Work; Driving and Holding the Work; Putting Cutting Tools to Work; Speeds and Feeds; Cutting Fluids; Turning in the Lathe; and Thread Cutting.

ARC AND ACETYLENE WELDING. By Harry Kerwin. 240 pages, 5 by 8 inches. 201 illustrations. Published by the McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. Price, $2.50.

This is a non-technical book on acetylene and electric welding intended for the beginner or for anyone who wishes to obtain a clear conception of the practical side of welding. It is not an outline of a welding course, but covers all the important steps in welding technique. Many of these steps are often learned by the welder after years of experience by the trial-and-error method.

A MANUAL OF BLUEPRINT READING. By Carl L. Svensen and William E. Street. 98 pages, 6 3/4 by 9 3/4 inches. Published by the D. Van Nostrand Co., 250 Fourth Ave., New York 3, N. Y. Price, $1.90.

This book is intended to furnish a foundation to the student that will enable him to acquire proficiency in reading prints or drawings of any kind. It consists of a series of drawings, covering a wide variety of parts, together with questions and exercises for each, arranged in sections.

BIBLIOGRAPHY OF INDUSTRIAL ENGINEERING AND MANAGEMENT LITERATURE TO JANUARY 1, 1943. By Ralph M. Barnes and Norma A. Englert. 80 pages, 8 1/2 by 11 inches. Published by the State University of Iowa, College of Engineering, Iowa City, Iowa. Price, $1.50.

EVALUATING APPRENTICES — COST OF TRAINING AND VALUE OF PRODUCTION OF APPRENTICES. 20 pages, 5 3/4 by 9 inches. Distributed without charge by the Apprentice-Training Service, Bureau of Training, War Manpower Commission, Washington, D. C.

HOW TO RUN A LATHE. Forty-second Edition. 128 pages, 5 by 8 inches. Published by the South Bend Lathe Works, South Bend, Ind. Price, paper-bound, 25 cents; leatherette-bound, 75 cents.

* * *

A.S.M.E. Receives Ordnance Department Distinguished Service Award

Major General L. H. Campbell, Jr., Chief of Ordnance, has notified the American Society of Mechanical Engineers that it has been honored with the Distinguished Service Award of the Ordnance Department "in recognition of scientific and engineering achievement, particularly in connection with the war effort."

The Society maintained close contact with the Ordnance Department during the years between the first World War and the present war through its National Defense Committee, which was reorganized in recent years and renamed the War Production Committee, with Colonel James L. Walsh as chairman. The Society has also served the War Production Board through its Manufacturing Engineering Committee, of which L. C. Morrow is chairman.

* * *

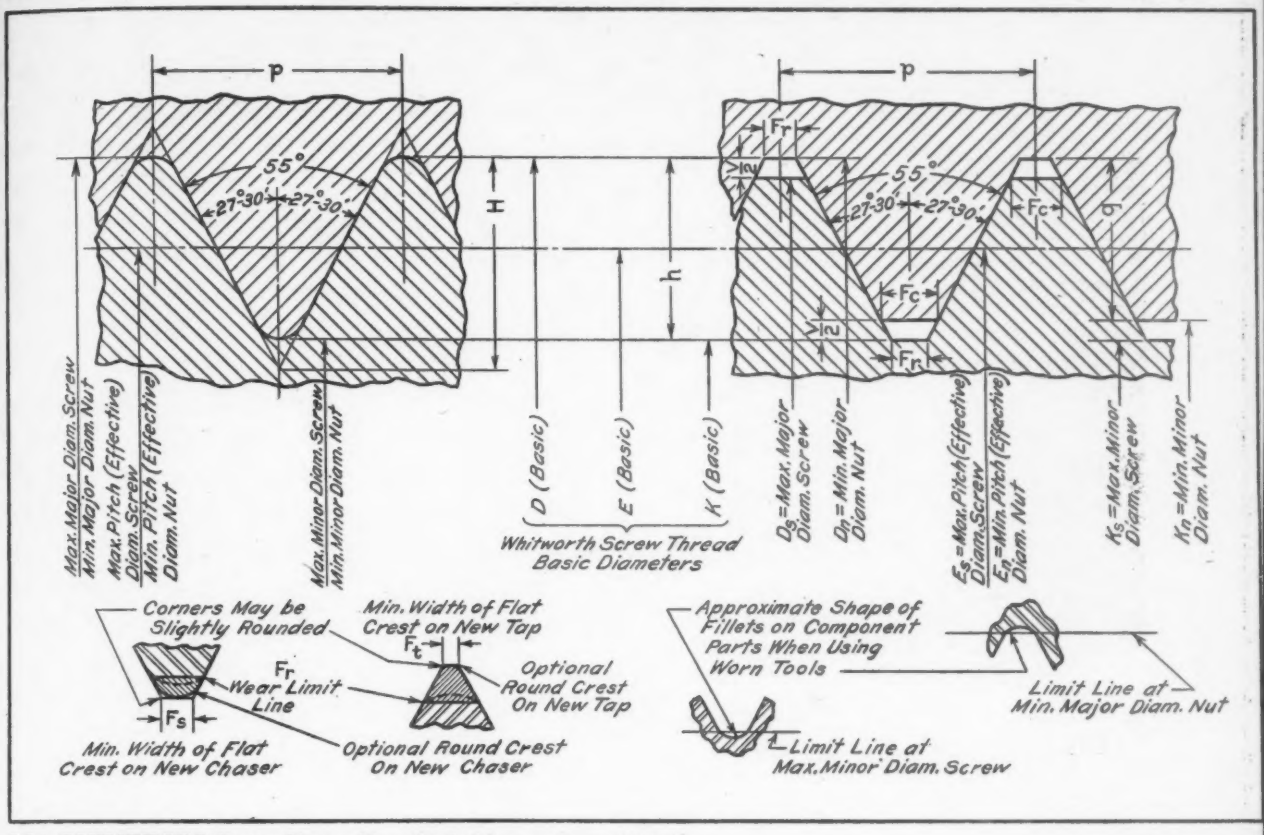
Long Service with One Company

The National Supply Co.'s Spang-Chalfant Division, Etna, Pa., recently honored employes having long service records with a dinner and entertainment. A. E. Walker, chairman and president of the company, presented each veteran with a gold pin bearing a diamond for each five years of service. Among those honored was Charles Theil, seventy years old, who has been with the company for fifty-five years. Forty-eight men had been with the company from forty to fifty-five years, and sixty-six men from thirty-five to forty years.

MACHINERY'S DATA SHEETS 525 and 526

SCREW THREADS WITH TRUNCATED WHITWORTH FORM—1

(Approved by the American Standards Association, June, 1944)



MACHINERY'S Data Sheet No. 525, November, 1944

SCREW THREADS WITH TRUNCATED WHITWORTH FORM—2

(Approved by the American Standards Association, June, 1944)

Threads per Inch	Pitch p*	Depth of Basic Thread h	Height of Truncated Thread q	Min. Crest Width F_c	Max. Root Width F_r	Min. Width of Flat, New Chaser F_s	Min. Width of Flat, New Tap F_t	Allowance at Pitch Diam. (Effect. Diam.)	Double Height of Segment BSW Crest V
40	0.025000	0.016008	0.014160	0.0061	0.0042	0.0021	0.00125	0.0007	0.003696
36	0.027778	0.017787	0.015734	0.0068	0.0046	0.0023	0.0014	0.0008	0.004107
32	0.031250	0.020010	0.017700	0.0076	0.0052	0.0026	0.0016	0.0009	0.004620
28	0.035714	0.022869	0.020229	0.0087	0.0060	0.0030	0.0018	0.0010	0.005280
26	0.038462	0.024628	0.021785	0.0094	0.0064	0.0032	0.0019	0.0011	0.005686
24	0.041667	0.026681	0.023601	0.0102	0.0069	0.0035	0.0021	0.0012	0.006160
22	0.045455	0.029106	0.025746	0.0111	0.0076	0.0038	0.0023	0.0013	0.006720
20	0.050000	0.032016	0.0283205	0.0122	0.0083	0.0042	0.0025	0.0014	0.007392
18	0.055556	0.035574	0.031467	0.0135	0.0093	0.0046	0.0028	0.0016	0.008213
16	0.062500	0.040020	0.035401	0.0152	0.0104	0.0052	0.0031	0.0018	0.009240
14	0.071429	0.045738	0.040458	0.0174	0.0119	0.0060	0.0036	0.0020	0.010560
12	0.083333	0.053360	0.047201	0.0203	0.0139	0.0069	0.0042	0.0024	0.012320
11	0.090909	0.058211	0.051492	0.0221	0.0152	0.0076	0.0045	0.0026	0.013440
10	0.100000	0.064033	0.056641	0.0244	0.0167	0.0083	0.0050	0.0028	0.014784
9	0.111111	0.071147	0.062934	0.0271	0.0185	0.0093	0.0056	0.0031	0.016426
8	0.125000	0.080041	0.070801	0.0305	0.0208	0.0104	0.00625	0.0035	0.018479
7	0.142857	0.091475	0.080916	0.0348	0.0238	0.0119	0.0071	0.0040	0.021119
6	0.166667	0.106721	0.094402	0.0406	0.0278	0.0139	0.0083	0.0047	0.024639
5	0.200000	0.128065	0.113282	0.0487	0.0333	0.0167	0.0100	0.0057	0.029567
4 1/2	0.222222	0.142295	0.125869	0.0541	0.0370	0.0185	0.0111	0.0063	0.032852
4	0.250000	0.160082	0.141602	0.0609	0.0417	0.0208	0.0125	0.0071	0.036959
3 1/2	0.285714	0.182950	0.161831	0.0696	0.0476	0.0238	0.0143	0.0081	0.042239

*See Data Sheet No. 525 for notation used.

MACHINERY'S Data Sheet No. 526, November, 1944

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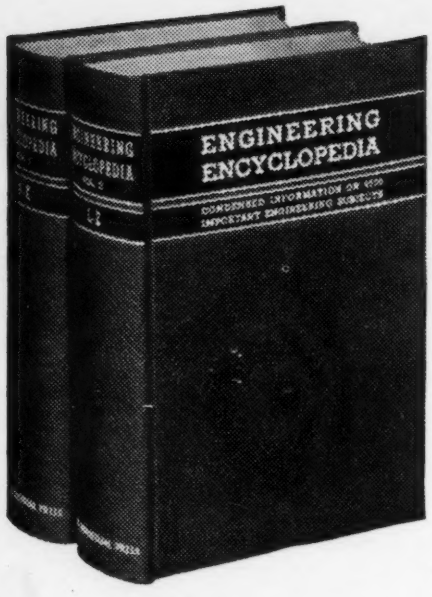

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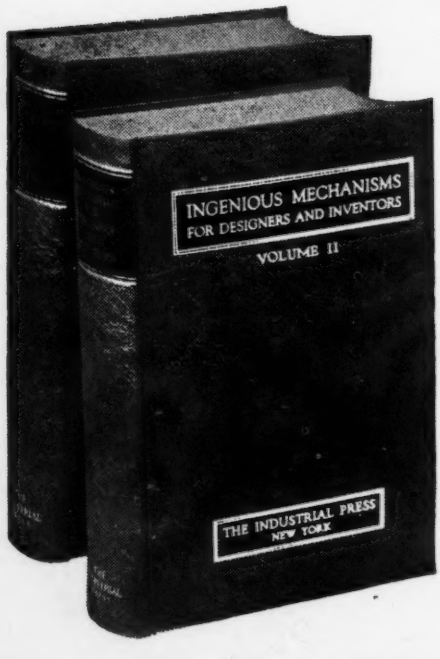

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